# APPENDIX

# Minutes of Meeting 1

# MINUTES OF MEETING
## FOR
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
## IN
## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA


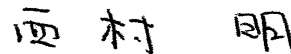## AGREED UPON BETWEEN


## SURVEY DEPARTMENT OF SRI LANKA
## (SDSL)


## AND


## JICA STUDY TEAM
## (JAPAN INTERNATIONAL COOPERATION AGENCY)


Colombo

9TH March, 2010


| | |
|---|---|
| Mr. S. M. W. Fernando | Mr. Akira Nishimura |
| Surveyor General | Leader |
| Survey Department of Sri Lanka | JICA Study Team |
| Ministry of Land, Land Development | Japan International Cooperation Agency |
| Settlement and Ranaviru Welfare | (JICA) |

JICA Study Team for "Digital Topographic Mapping Project for Reconstruction of Northern region in Democratic Social Republic of Sri Lanka" (hereinafter referred to as the "JICA Study Team"), and Survey Department of Sri Lanka (hereinafter referred to as "SDSL") held a meeting concerning the Inception Report of "Digital Topographic Mapping Project for Reconstruction of Northern region in Democratic Social Republic of Sri Lanka" on the 4th day of March 2010, from 14:05 to 15:45 at the SDSL Surveyor General meeting room.

JICA Study Team explained about the followings based on the Inception Report.
a) Basic Implementation Policies.
b) Implementation Procedures.
c) Work Planning.
d) Personnel Planning.
e) Details of Responsibility of Each Project Member.
f) Measure to be taken by the Government of Sri Lanka

The JICA Study Team answered the following questions raised by SDSL.
1. Q) Could you take the aerial photography continuously between Line 44-1 and 44-2, Line 45-1 and 45-2, Line 46-1 and 46-2 respectively?
   A) We will make a contract with an aerial photography company by areas. but we would like to negotiate a contractor to take an aerial photography continuously in these lines.

   Q) Do you carry out GPS survey for IMU/GPS system while taking an aerials photo to determine the position of principal points?.
   A) Yes, we will carry out GPS survey while taking aerial photos.

   Q) The rate of each lap is expressed in the standards, how do you deal with when the rate of lap is not sufficient to carry out a successive works?
   A) We will ask the contractor to retake aerial photos.

   Q) SDSL would like to confirm the number of photo control points.
   A) The number of horizontal photo control points will be approx 100 points, the number of vertical photo control points will be approx 200 points.

   Q) Do you use existing control points as photo control points that will be pre-marked before taking aerial photos?
   A) We will use them as photo control point if possible.

   Q) Which area do you give a high priority for a photo control point survey?

A) Jaffna and Manner areas will be given the high priority.

Q) When do we complete the photo control survey?
A) You will complete the all photo control point survey including leveling and calculations by the end of June when this work will be started at the middle of April.

Q) How do you carry out an aerial triangulation?
A) We will carry out an analogue and a digital aerial triangulation considering of the situation of equipment in SDSL.

Q) What is the accuracy of vertical point?
A) .We might expect that the average of sprit leveling point and GPS leveling point shall have 10 cm in RMS.

Q) Is it sufficient that the resolution of scanning is 20 micron?
A) It is sufficient. In case of a higher resolution, it is inconvenience for successive work, for example digital plotting, because of too much loading for a digital plotting system.

Q) Is it possible to transfer from the topographic map data scale 1:10,000 to 1: 50,000 through a reduction editing?
A) It is possible to transfer from the topographic map data scale 1:10,000 to 1: 50,000 through a reduction editing with complicated procedures under the condition that both scale map symbol regulations are prepared.

Q) Could you provide the 2 sets of contact prints in colour instead of a set?
A) .We will negotiate JICA head office to provide additional set of contact prints of JICA.

Q) Could you provide the report on quality control?
A) .We promise you to provide the report on quality control.

The conclusions of the explanation and discussions of Inception Report were as follows:
1.  In principle, SDSL agreed on the Inception Report prepared by the JICA Study Team.

The members attended the meeting are listed in Appendix-1.

# LIST OF ATTENDANTS

<u>Sri Lanka Side</u>:

Survey Department of Sri Lanka (SDSL)

| | |
|---|---|
| 1. Mr. S. M. W. Fernando | Surveyor General |
| 2. Mr. D. N. D. Hettiarachchi | Deputy Surveyor General (LIS/GIS) |
| 3. Mr. S. D. P. J. Dampegama | Deputy Surveyor General (Geodetic) |
| 4. Mr. K. W. N. D. Karunaratne | Additional Surveyor General (Field) |
| 5. Mr. K. Thavalingam | Additional Surveyor General (Central) |
| 6. Mr. C. Kumarasinghe | Senior Superintendent of Surveys (Air) |
| 7. Mr. S. Sivanantharajah | Senior Superintendent of Surveys (GIS) |
| 8. Mr. K. D. Parakum Shantha | Senior Superintendent of Surveys |
| 9. Mr. D. T. N. Jayasamana | Assistant Superintendent of Surveys |

<u>Japanese Side</u>:

JICA Study Team

| | |
|---|---|
| 1. Mr. Akira Nishimura | Team Leader of JICA Study Team |
| 2. Mr. Zenichi Chiba | Surveyor |
| 3. Mr. Kentaro Usuda | Surveyor |
| 4. Mr. Yoshimitsu Fukumoto | Surveyor |

<u>JICA Sri Lank Office</u>

| | |
|---|---|
| 1. Mr. Tsuneo OISHI | Projection Formulation Advisor |

# MINUTES OF MEETING
## FOR
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
## IN
## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA


### AGREED UPON BETWEEN


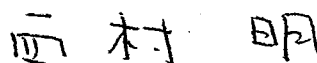### SURVEY DEPARTMENT OF SRI LANKA
### (SDSL)


### AND


### JICA STUDY TEAM
### (JAPAN INTERNATIONAL COOPERATION AGENCY)


Colombo

30th September, 2010


_____

Mr. S. M. W. Fernando
Surveyor General
Survey Department of Sri Lanka
Ministry of Land, Land Development
Settlement and Ranaviru Welfare

_____

Mr. Akira Nishimura
Leader
JICA Study Team
Japan International Cooperation Agency
(JICA)

JICA Study Team for "Digital Topographic Mapping Project for Reconstruction of Northern region in Democratic Social Republic of Sri Lanka" (hereinafter referred to as the "JICA Study Team"), and Survey Department of Sri Lanka (hereinafter referred to as "SDSL") held a meeting concerning the Interim Report of "Digital Topographic Mapping Project for Reconstruction of Northern region in Democratic Social Republic of Sri Lanka" on the 28th day of September 2010, from 9:05 to 10:08 at the SDSL Surveyor General meeting room.

JICA Study Team explained about the followings based on the Inception Report.
a) Basic Implementation Policies.
b) Project Progress.
c) Interim Results and Evaluation of the Project.
d) Future Policy.
e) Future Work Plan.

The JICA Study Team answered the following questions raised by SDSL.
1.  Q) Was the digital aerial triangulation for the aerial photographed areas carried out smoothly without any problems including the result of the photo control points survey?
    A) The digital aerial triangulation for the aerial photographed was carried out smoothly without any troubles. We got the good results of the digital aerial triangulation as mentioned in the interim report. We are bringing the part of the results of the digital aerial triangulation and utilizing it in the technical transfer of aerial triangulation.
    Q) When do you restart the aerial photography for the remaining areas?
    A) . The aerial photography for the remaining areas will be restarted around the middle of January 2011. We might expect that the aerial photography for remaining areas will be carried out in January and February 2012. For the smooth implementation of aerial photography, the study team will contact directly the head office of Finnmap and ask them to inform us the crews of aircraft, the aircraft, the route of ferry flight and the date of ferry flight. The study team will provide these information SDSL as soon as possible.
    Q) How dose the study team carry out the supplementary field identification?
    A) . The study team requested SDSL to organize the 10 survey teams for carrying out the supplementary field identification. For this requests, SDSL informed that the man power is no problem and the vehicles are problems. Then SDSL requests to have the discussion with the study team.
    The supplementary field identification will carried out from the middle of October to middle of the November.

The conclusions of the explanation and discussions of Interim Report were as follows:
1.  In principle, SDSL agreed on the Interim Report prepared by the JICA Study Team.

At the end of the meeting concerning, JICA Sri Lanka office asked SDSL about the publication of the results of the project, that is the publication of the digital topographic map. SDSL answered that all results, that is a digital topographic map, will be planned to make in public for any person and any organization even if the digital topographic map covering the Northern Province. SDSL will provide the any topographic map with cost ( for covering the necessary cost of SDSL). For the government organization use and special use, SDSL will provide it without cost.

In case of the aerial photograph, it is necessary to get the permission of the deafens ministry for the entire country.

The members attended the meeting are listed in Appendix-1.

# LIST OF ATTENDANTS

Sri Lanka Side:

Survey Department of Sri Lanka (SDSL)

| | | |
|---|---|---|
| 1. Mr. S. M. W. Fernando | | Surveyor General |
| 2. Mr. D. N. D. Hettiarachchi | | Deputy Surveyor General (LIS/GIS) |
| 3. Mr. K. W. N. D. Karunaratne | | Additional Surveyor General (Field) |
| 4. Mr. K. Thavalingam | | Additional Surveyor General (Central) |
| 5. Mr. S. Sivanantharajah | | Senior Superintendent of Surveys (GIS) |
| 6. Mr. D. T. N. Jayasamana | | Assistant Superintendent of Surveys |

Japanese Side:

JICA Study Team

1. Mr. Akira Nishimura      Team Leader of JICA Study Team
2. Mr. Takashi Harada       Sub-team Leader of JICA Study Team
3. Mr. Mitsutomo Nakamura   Surveyor
4. Mr. Takayuki Kato        Coordinator 1

JICA Sri Lank Office
1. Mr. Hiroaki ADACHI       Representative

# MINUTES OF MEETING
## FOR
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
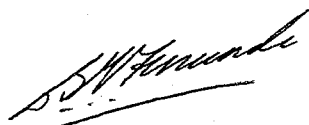## IN
## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA


### AGREED UPON BETWEEN
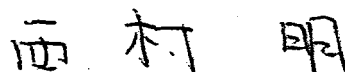
### SURVEY DEPARTMENT OF SRI LANKA
### (SDSL)

### AND

### JICA STUDY TEAM
### (JAPAN INTERNATIONAL COOPERATION AGENCY)


Colombo
8th November, 2011


Mr. S. M. W. Fernando

Surveyor General

Survey Department of Sri Lanka

Ministry of Land, Land Development

Settlement and Ranaviru Welfare

Mr. Akira Nishimura

Leader

JICA Study Team

Japan International Cooperation Agency

(JICA)

JICA Study Team for "Digital Topographic Mapping Project for Reconstruction of Northern region in Democratic Social Republic of Sri Lanka" (hereinafter referred to as the "JICA Study Team"), and Survey Department of Sri Lanka (hereinafter referred to as "SDSL") held a meeting concerning the Draft Final Report of "Digital Topographic Mapping Project for Reconstruction of Northern region in Democratic Social Republic of Sri Lanka" on the 1st day of November 2011, from 14:00 to 15:30 at the SDSL Surveyor General meeting room.

JICA Study Team explained about the following based on the Draft Final Report.
a) Outline of the Project
b) Project Implementation
c) Results of the Project.
d) Efforts toward the Development of Digital Topographic Maps

After the explanation of the draft final report, the discussion was implemented.
The contents of the discussion were as follows:

1. SDSL pointed out some typographical errors and omissions and requested corrections of the expressions in the report. The study team agreed to correct the typographical errors, omissions and the expressions in the report.

2. The process that the cross section aerial photography was cancelled at an actual stage of the aerial photography shall be added postscript in the report.

3. SDSL requested to attaché the calibration data of aerial camera with the report. The study team agreed to attach it with the report.

4. The both side, SDSL and The study team, agreed to write down the results of the questionnaire concerning the demand survey of map users that will be carry out at the seminar/workshop in the report.

5. The study team asked what a kind of the lesson learned SDSL took during the project implementation. SDSL replied that SDSL learned a lot of things including the acquired technologies in the technology transfer and the results of project are very useful. Also, it was stated that the results of field survey (the description of photo control points), the map symbol specification, the manuals of the technology transfer and the work manual of the various data were very useful for the future works in SDSL.

6. SDSL has the plan of creating the digital topographic map for the rest of unmapped areas of the Northern Province. In this plan, it is planed that it will be carried out with 5 sheets (200km2) per month in plotting/compilation and 2 sheets (80km2) per month in field identification. The priority areas are defined according to the relevant ministry requests. And the detailed plan (schedule) will be shown in the seminar/wokshop. The detailed plan will be attached with the report.

7. In the above plan, SDSL will plan to use a various plotters including analogue plotters with

encoder. The indoor works (plotting/compilation) and the outdoor works (field identification) will be carried out parallel.

8. SDSL plans to create the orthophoto apart from the creation of digital topographic maps. It is planed that it will be carried out with 4 sheets (160km2) per month.

The conclusions of the explanation and discussions of Draft Final Report were as follows:

1.  In principle, SDSL agreed on the Draft Final Report prepared by the JICA Study Team.

The members attended the meeting are listed in Appendix-1.

# LIST OF ATTENDANTS

Sri Lanka Side:

Survey Department of Sri Lanka (SDSL)

| | | |
|---|---|---|
| 1. Mr. S. M. W. Fernando | Surveyor General |
| 2. Mr. K. W. N. D. Karunaratne | Additional Surveyor General (Field) |
| 3. Mr. K. Thavalingam | Additional Surveyor General (Central) |
| 4. Mr. K. Dayananda | Senior Deputy Surveyor General (Mapping) |
| 5. Mr. K. A. U. N. Kasthuri | Senior Deputy Surveyor General (R&D) |
| 6. Mrs. Shyamalie Perera | Deputy Surveyor General (LIS/GIS) |
| 7. Mr. Pushakumara K. Vitana | Senior Superintendent of Survey (Mapping) |
| 8. Mr. S. Sivanantharajah | Senior Superintendent of Survey (GIS) |
| 9. Ms. S. A. I. Swarnalath | Photogrammerist |

Japanese Side:

JICA Study Team

| | |
|---|---|
| 1. Mr. Akira Nishimura | Team Leader of JICA Study Team |
| 2. Mr. Takashi Harada | Sub-team Leader of JICA Study Team |
| 3. Mr. Takao Ikeda | Surveyor |
| 4. Mr. Che Wetao | GIS Engineer |
| 5. Mr. Norio Ishijima | Coordinator 1 |

JICA Sri Lank Office

| | |
|---|---|
| 1. Ms. Namal Ralapanawa | Project Specialist |

# Minutes of Meeting 2

# MEMORANDUM
## FOR
## MAP SPECIFICATION
## ON
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
## IN
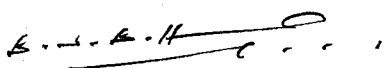## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

## AGREED UPON BETWEEN

## SURVEY DEPARTMENT OF SLI LANKA
## (SDSL)

## AND

## JICA STUDY TEAM
## (JAPAN INTERNATIONAL COOPERATION AGENCY)

Colombo
22th March, 2010


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Mr. D.N.D. Hettiarachchi
Deputy Surveyor General (LIS/GIS)
Survey Department of Sri Lanka
Ministry of Land, Land Development
Settlement and Ranaviru Welfare

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Mr. Zenichi CHIBA
Map Specification
JICA Study Team
Japan International Cooperation Agency
(JICA)

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Mr. S. Sivanantharajah
Senior Superintendent of Surveys (GIS)
Survey Department of Sri Lanka
Ministry of Land, Land Development
Settlement and Ranaviru Welfare

JICA Study Team for "Digital Topographic Mapping Project for Reconstruction of Northern Region in Democratic Social Republic of Sri Lanka" (hereinafter referred to as the "JICA Study Team"), and Survey Department of Sri Lanka (hereinafter referred to as "SDSL") held a meeting concerning the map specification of "Digital Topographic Mapping Project for Reconstruction of Northern Region in Democratic Social Republic of Sri Lanka".

Both sides confirmed as below:

1) Survey standard

The survey standards are as follows:

| | |
|---|---|
| Spatial reference system: | Sri Lanka Datum 1999 (SLD99): SLD-99-2 |
| Reference ellipsoid: | Everest (India 1830) |
| Projection: | Transverse Mercator Projection |
| Map Projection Origin: | Pidurutalagala   (200,000m, 200,000m) |
| | Kandawara is one of observation points. It is not the map projection origin. |
| Standard of elevation: | In accordance with the existing bench marks |
| | Datum for all levels is the Mean Sea Level |
| Annotation: | The following annotation will be attached to data files |

This digital map was prepared jointly by Japan International Cooperation Agency (JICA) under the Japanese Government Technical Cooperation Program and the Government of Sri Lanka.

Projection detail and transformation parameters are expressed in the Appendix-1.

2) Mapping area

| | |
|---|---|
| Map scale: | 1:10,000 |
| Map size: | 8 km wide   x   5km height |
| Map sheets: | Jaffna Peninsula        69 sheets |
| | Mannar                       31 sheets |
| Total mapping area: | Approximately 2,000 km$^2$ |

Detailed mapping area is expressed in the Appendix-2(Jaffna Peninsula and Mannar) .

END

# Sri Lanka Datum 1999 (SLD-99-2)

Coordinates of Pidurutalagala – 200 000m N, 200 000m E

## Transformation Parameters - WGS 84 to Everest Ellipsoid

| Shifts | X= 0.2933 |
| | Y= -766.9499 |
| | Z= -87.7131 |

| Rotation | X= 0.1957040 seconds |
| | Y= 1.6950677 |
| | Z= 3.4730161 |

Scale Factor    1.0000000393

## Projection Parameters - Everest Ellipsoid to Transverse Mercator Projection

Everest India 1830

| Semi-major axes | = 6,377,276.345 m |
| Semi-minor axes | = 6,356,075.413 m |

| False Easting | 200 000 m |
| False Northing | 200 000 m |

| Central Meridian | 80 46 18.16700 E |
| Central Parallel | 7 00 1.69750 N |

Scale Factor    0.9999238418
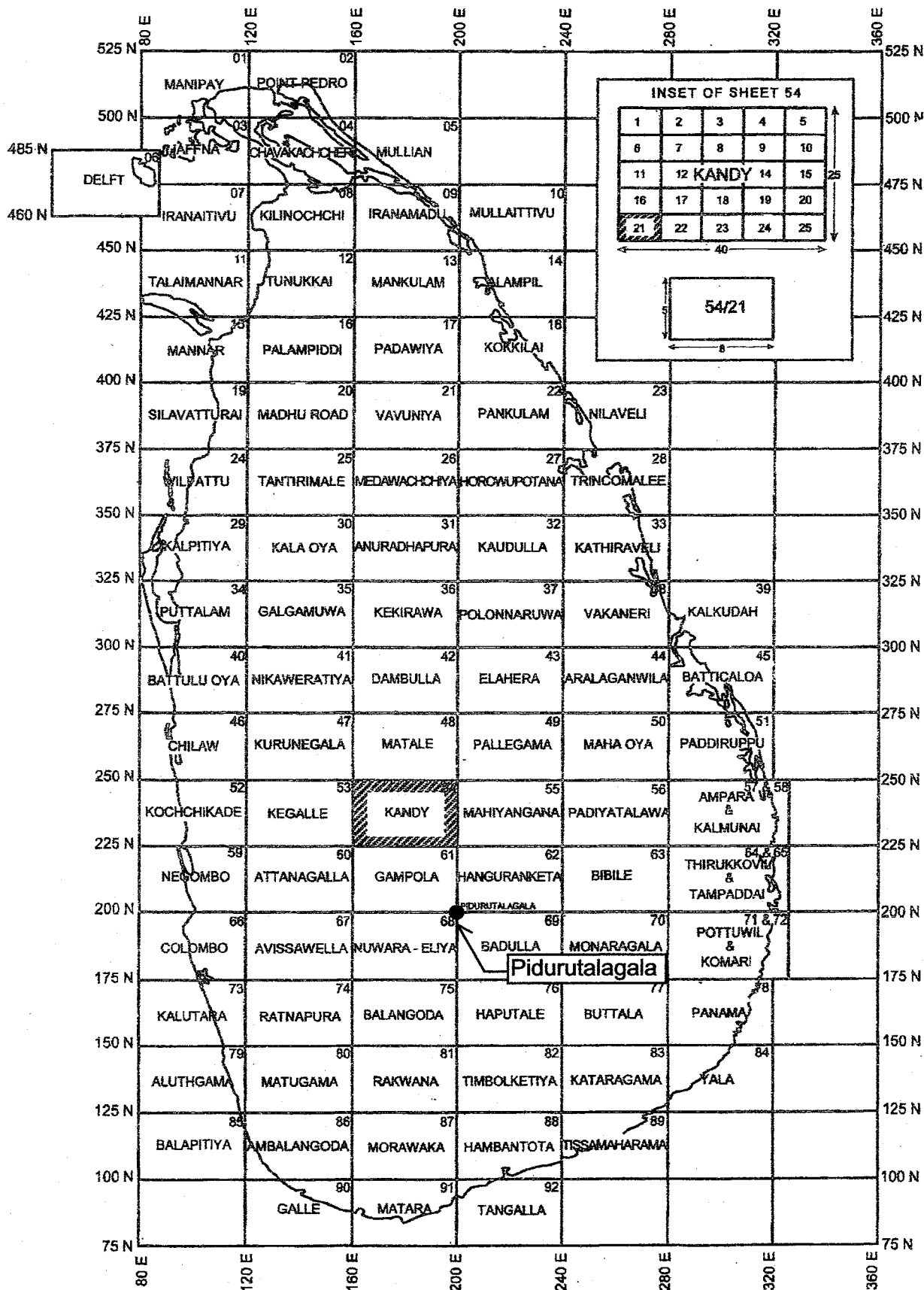
1. Sheet values are given in kilometres; 1 Kilometre = 1000 metres

2. 92 topo sheets at 1/50,000 scale cover the country as shown above and each has a name and number. e.g: Kandy 54

3. Each 1/50,000 sheet is subdivided into 25 - 1/10,000 sheets as shown in the inset and each 1/10,000 sheet is given a number. e.g:54/21

Jaffna Peninsula Area

| Point_ID | X Co-ordinate | Y Co-ordinate |
|---|---|---|
| 1 | 104,000.000 | 515,000.000 |
| 2 | 144,000.000 | 515,000.000 |
| 3 | 144,000.000 | 510,000.000 |
| 4 | 152,000.000 | 510,000.000 |
| 5 | 152,000.000 | 500,000.000 |
| 6 | 160,000.000 | 500,000.000 |
| 7 | 160,000.000 | 495,000.000 |
| 8 | 168,000.000 | 495,000.000 |
| 9 | 168,000.000 | 485,000.000 |
| 10 | 176,000.000 | 485,000.000 |
| 11 | 176,000.000 | 480,000.000 |
| 12 | 184,000.000 | 480,000.000 |
| 13 | 184,000.000 | 475,000.000 |
| 14 | 192,000.000 | 475,000.000 |
| 15 | 192,000.000 | 470,000.000 |
| 16 | 152,000.000 | 470,000.000 |
| 17 | 152,000.000 | 480,000.000 |
| 18 | 144,000.000 | 480,000.000 |
| 19 | 144,000.000 | 485,000.000 |
| 20 | 104,000.000 | 485,000.000 |
| 21 | 104,000.000 | 480,000.000 |
| 22 | 88,000.000 | 480,000.000 |
| 23 | 88,000.000 | 470,000.000 |
| 24 | 80,000.000 | 470,000.000 |
| 25 | 80,000.000 | 475,000.000 |
| 26 | 72,000.000 | 475,000.000 |
| 27 | 72,000.000 | 485,000.000 |
| 28 | 88,000.000 | 485,000.000 |
| 29 | 88,000.000 | 505,000.000 |
| 30 | 96,000.000 | 505,000.000 |
| 31 | 96,000.000 | 510,000.000 |
| 32 | 104,000.000 | 510,000.000 |

Land area in sq. km

Jaffna          1272.923

Mannar Area

| Point_ID | X Co-ordinate | Y Co-ordinate |
|---|---|---|
| 33 | 120,000.000 | 435,000.000 |
| 34 | 128,000.000 | 435,000.000 |
| 35 | 128,000.000 | 395,000.000 |
| 36 | 104,000.000 | 395,000.000 |
| 37 | 104,000.000 | 410,000.000 |
| 38 | 96,000.000 | 410,000.000 |
| 39 | 96,000.000 | 420,000.000 |
| 40 | 88,000.000 | 420,000.000 |
| 41 | 88,000.000 | 425,000.000 |
| 42 | 80,000.000 | 425,000.000 |
| 43 | 80,000.000 | 435,000.000 |
| 44 | 104,000.000 | 435,000.000 |
| 45 | 104,000.000 | 430,000.000 |
| 46 | 112,000.000 | 430,000.000 |
| 47 | 112,000.000 | 425,000.000 |
| 48 | 120,000.000 | 425,000.000 |

Land area in sq. km

Mannar          732.470

Total area in sq. l          2005.393

# Project Area - Jaffna Peninsula



Kilometers
0    5    10    20    30    40
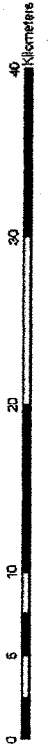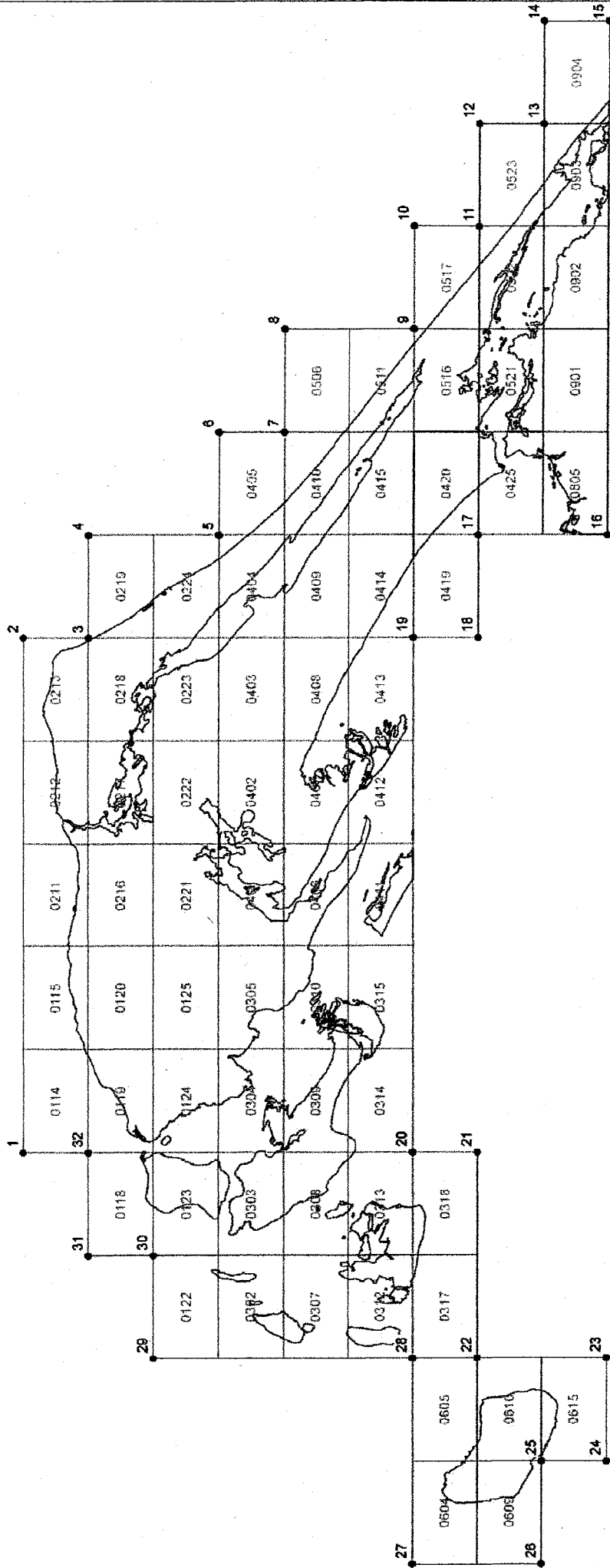
# Project Area - Mannar
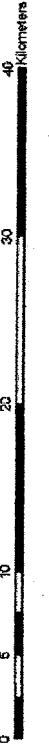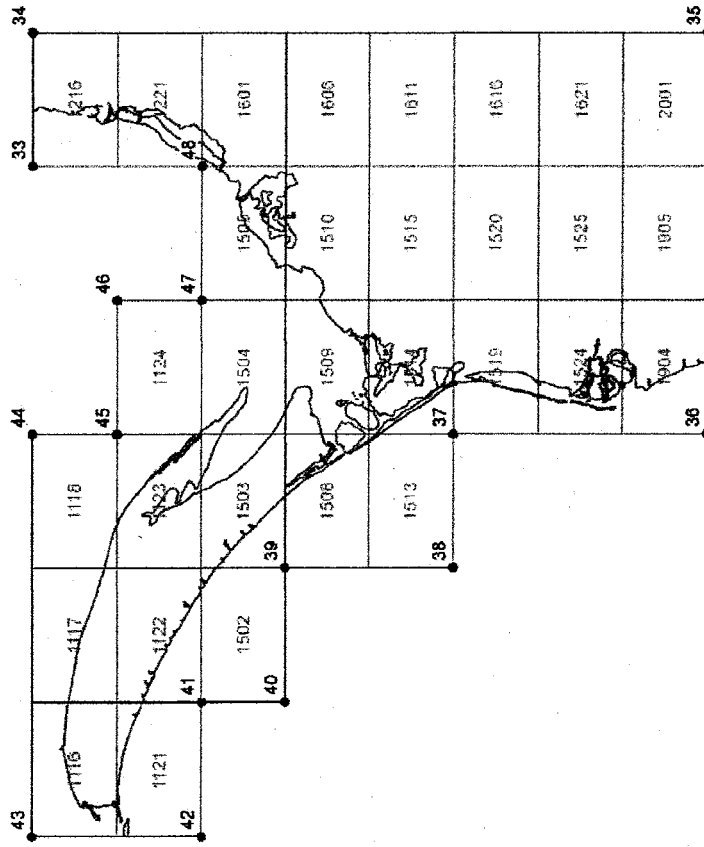


Kilometers
0  5  10    20    30    40

# MINUTES OF MEETING
## FOR
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
## IN
## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

### AGREED UPON BETWEEN

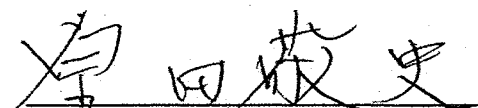### SURVEY DEPARTMENT OF SRI LANKA
### (SDSL)

### AND

### JICA STUDY TEAM
### (JAPAN INTERNATIONAL COOPERATION AGENCY)

Colombo

18TH June, 2010


_____

Mr. S. M. W. Fernando

Surveyor General

Survey Department of Sri Lanka

Ministry of Land, Land Development,

Settlement and Ranaviru Welfare


_____

Mr. Takashi Harada

Sub leader

JICA Study Team

Japan International Cooperation Agency

(JICA)

JICA Study Team for "Digital Topographic Mapping Project for Reconstruction of Northern Region in the Democratic Socialist Republic of Sri Lanka" (hereinafter referred to as the "JICA Study Team"), and Survey Department of Sri Lanka (hereinafter referred to as "SDSL") held a meeting concerning the schedule of Aerial Photography on the 27th day of May 2010 at the SDSL.

JICA Study Team explained the schedule of Aerial Photography.
a) The reasons for the delayed schedule of aerial photography.
b) The original schedule of aerial photography for this assignment.
c) The next schedule of aerial photography.
   The next schedule: The aerial photography for the remaining areas will be carried out in the coming dry season, which is January and February 2011.

The conclusions of the meeting of the next schedule of aerial photography were as follows:
1. In principle, SDSL agreed on the next schedule of aerial photography for the remaining areas proposed by the JICA Study Team.

The members who attended the meeting are listed in Appendix-1.

# LIST OF ATTENDANTS

<u>Sri Lankan Side</u>:

Survey Department of Sri Lanka (SDSL)

1. Mr. S. M. W. Fernando          Surveyor General

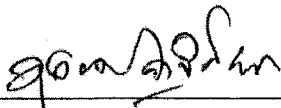2. Mr. D. N. D. Hettiarachchi      Deputy Surveyor General (LIS/GIS)


<u>Japanese Side</u>:

JICA Study Team

1. Mr. Takashi Harada          Team Sub Leader of JICA Study Team
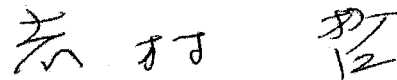2. Mr. Kazuhiro Ishizuka       Surveyor

# MINUTES OF MEETING
## ON
## AMENDMENT OF SCHEDULE
## OF
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
## IN
## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
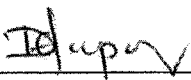

Colombo

22nd December, 2010


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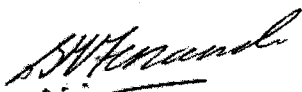Mr. T\ Asoka Peiris

Secretary

Ministry of Land and Land Development


_____

Mr. Akira Shimura

Chief Representative

Japan International Cooperation Agency

Sri Lanka Office


_____

Ms. C. Hapugoda

Director

Japan Division, Department of External Resources

Ministry of Finance and Planning


_____

Mr. S. M. W. Fernando

Surveyor General

Survey Department

Ministry of Land and Land Development

During the first dry season (from March to April, 2010) – which is suitable for aerial photography, it was planned to take all aerial photograph for the "Digital Topographic Mapping Project for Reconstruction of Northern Region in Democratic Socialist Republic of SRI LANKA" (hereinafter referred to as "the Project"). However, due to the delay in acquiring photographic equipments caused by machine trouble as well as bad weather conditions, the obtained aerial photograph remained only 20% in total. Since next dry season is expected to start in January 2011 and also to secure sufficient periods for the technology transfer, it would be appropriate to extend the Project period as described in the attached schedule.

Accordingly, the Minutes of the Meeting has been prepared to agree on a new (tentative) schedule as amendment of the "IV PROJECT SCHEDULE" and the "V REPORTS AND FINAL PRODUCTS" in the Scope of Work signed on 22nd January 2010 between Survey Department, the Ministry of Land, Land Development, Settlement and Ranaviru Welfare and Japan International Cooperation Agency.

## IV PROJECT SCHEDULE

The Project will be implemented in accordance with the tentative project schedule as shown below. The schedule, including report submission dates stated in the next clause (V), is tentative and subject to be modified when both side agree upon and any necessary that arises in the course of the Project.

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| Work in Sri Lanka | | | | | | | | | | | | | | | | | | | |
| Work in Japan | | | | | | | | | | | | | | | | | | | |
| Reports | ▲ IC/R | | | | | | | ▲ IT/R | | | | | | | | | ▲ DF/R | ▲ F/R | |

IC/R : Inception Report, IT/R : Interim Report, DF/R : Draft Final Report, F/R : Final Report

## V REPORTS AND FINAL PRODUCTS

JICA will prepare and submit the following reports and final products of topographic mapping works to the GOSL.

1. Inception Report

Twenty-five (25) copies in English at the commencement of the Project

2. Interim Report

Twenty-five (25) copies in English within eighth (8) months after the beginning of the Project

3. Draft Final Report

Twenty-five (25) copies in English within seventeenth (17) months after the beginning of the

Project

4. Final Report

Twenty-five (25) copies in English within one (1) month after the receipt of the comments on the Draft Final Report

5. Final products of topographic mapping

    5-1 One (1) set of negative film, two (2) sets of contact prints and one (1) set of Dia-positives and scanned data or one (1) set of digital photo data and contact print.

    5-2 One (1) set of result of ground control point survey

    5-3 One (1) set of result of aerial triangulation of whole area as shown in attachment 1
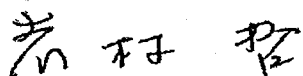
    5-4 One (1) set of 1:10,000 scale digital topographic data for printing of the area as shown in attachment 2

    5-5 One (1) set of 1:10,000 scale digital topographic data for GIS of the area as shown in attachment 2
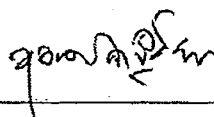
# MINUTES OF MEETING
## ON
## AMENDMENT OF SCHEDULE
## OF
## DIGITAL TOPOGRAPHIC MAPPING PROJECT
## FOR
## RECONSTRUCTION OF NORTHERN REGION
## IN
## DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

As a result of discussions during project implementation, the concerned authorities of the Government of Sri Lanka (hereinafter referred to as "GOSL") and Japan International Cooperation Agency (hereinafter referred to as "JICA") agreed on the matters described in the annexes attached hereto.
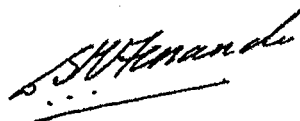
Colombo, May 2 , 2011

Akira Shimura
Chief Representative
Japan International Cooperation Agency
Sri Lanka Office

T. Asoka Peiris
Secretary
Ministry of Land, Land Development, Settlement and Ranaviru Welfare

M. P. D. U. K. Mapa Pathirana
Director General
Department External Resources
Ministry of Finance and Planning

S. M. W. Fernando
Surveyor General
Survey Department of Sri Lanka

According to the Minutes of Meeting signed on 22nd December 2010, the aerial photography for the "Digital Topographic Mapping Project for Reconstruction of Northern Region in Democratic Socialist Republic of SRI LANKA" (hereinafter referred to as "the Project"), was planned to be completed in the dry season of January 2011. However, due to bad weather conditions the aerial photography could be completed only in March 2011. Therefore, in order to secure sufficient period of time to complete the mapping process and technology transfer under the Project it would be appropriate to extend the Project period as described in the schedule below.

Accordingly, this Minutes of Meeting has been prepared to agree on a new time schedule amending Items "IV PROJECT SCHEDULE" and "V REPORTS AND FINAL PRODUCTS" in the Minutes of Meeting signed on 22nd December 2010 between GOSL side and Japan International Cooperation Agency. According to the amended time schedule, expected date of completion is end January 2012.

## IV PROJECT SCHEDULE

The Project will be implemented in accordance with the tentative project schedule as shown below. The schedule, including report submission dates stated in the next clause (V), is tentative and subject to be modified when both side agree upon and any necessary that arises in the course of the Project.

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Work in Sri Lanka | | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | ▬ | | |
| Work in Japan | ▯ | | | | | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | ▭ | | ▯ | | ▯ |
| Report | | ▲ IC /R | | | | | | ▲ IT /R | | | | | | | | | | | | | | ▲ DF /R | | ▲ F/ R |

IC/R : Inception Report, IT/R : Interim Report, DF/R : Draft Final Report, F/R : Final Report

## V REPORTS AND FINAL PRODUCTS

JICA will prepare and submit the following reports and final products of topographic mapping works to the GOSL.

1. Inception Report

Twenty-five (25) copies in English at the commencement of the Project

2. Interim Report

Twenty-five (25) copies in English within eighth (8) month after the beginning of the Project

3. Draft Final Report

Twenty-five (25) copies in English within twenty-second (22) month after the beginning of the

Project

4. Final Report

Twenty-five (25) copies in English within two (2) month after the receipt of the comments on the Draft Final Report

5. Final products of topographic mapping

    5-1 One (1) set of negative film, two (2) sets of contact prints and one (1) set of Dia-positives and scanned data or one (1) set of digital photo data and contact print.

    5-2 One (1) set of result of ground control point survey

    5-3 One (1) set of result of aerial triangulation of whole area as shown in attachment 1

    5-4 One (1) set of 1:10,000 scale digital topographic data for printing of the area as shown in attachment 2

    5-5 One (1) set of 1:10,000 scale digital topographic data for GIS of the area as shown in attachment 2

# Digital Map Symbol Regulation

# Map symbols for 1: 10,000 Scale Digital Topographic Maps

of

## Digital Topographic Mapping Project

for

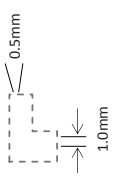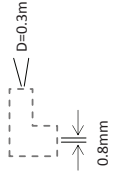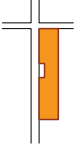## Reconstruction of Northern Region in Democratic Socialist Republic of SriLanka

**Map Symbols Draft Final Version (Oct '11)**
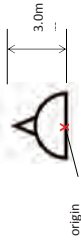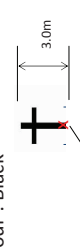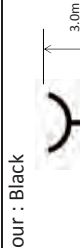
**October, 2011**

**Map symbols for 1:10,000 scale Digital Topographic Map**
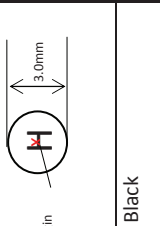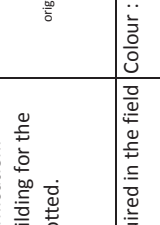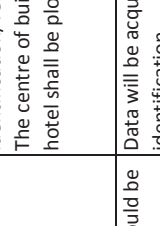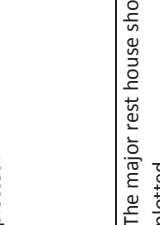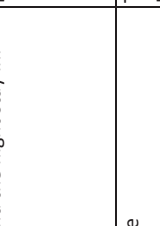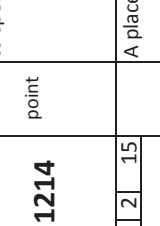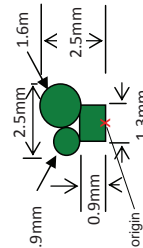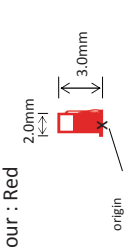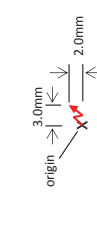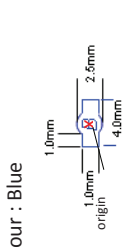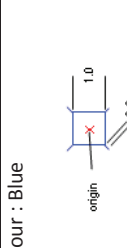
## 1.0 CONSTRUCTION
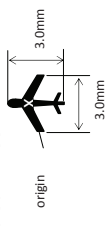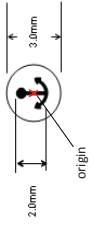
| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.c | No. | Data Type | Definition | Acquisition Criterion | Data Acquisition Method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Construction | Building | Independent Building/House | 1 | 1 | 1 / 1101 | polygon | 2 stories building. | The building whose short side length is more than 4 m should be plotted. | The edge of building shall be plotted at scale. The direction of plotting shall be clockwise. | Colour : Black70% width : 0.1mm | 1101 | | 0 | | 1 |
| | Construction | Building | Prominent Buildings/Rein-forced Concrete Building/Houses | 1 | 1 | 2 / 1102 | polygon | More than 3 stories permanent (Reinforced concrete) building | The building whose short side length is more than 4 m or equivalent should be plotted. | The edge of building shall be plotted at scale. The direction of plotting shall be clockwise. data shall be collected by photo identification/field verification/identification. | Filling Colour : Gray50%(C25%M20%Y15%) outline:Black70% width : 0.1mm | 1102 | | 0 | | 1 |
| | Construction | Building | Temporary Building | 1 | 1 | 3 / 1103 | polygon | The building that is constructed temporary, including hut for refugees and military camps. | The building that the short side of building is more than 4 m or equivalent should be plotted. | Data will be acquired by the photo interpretation. The edge of building shall be plotted. The direction of plotting is a clockwise. | Colour : Black70% width : 0.1mm  0.5mm  1.0mm | 1103 | | 0 | | 1 |
| | Construction | Building | Ruin, None-wall Building and Under Constructed Building | 1 | 1 | 4 / 1104 | polygon | Abandoned building/buildings without wall/underconstruction | The building that the short side of building is more than 4 m should be plotted. | The edge of building shall be plotted. The direction of plotting is a clockwise. | Colour : Black70%width : 0.1mm  D=0.3mm  0.8mm | 1104 | | 0 | | 1 |
| | Construction | Building | Congested Housing Area | 1 | 1 | 5 / 1105 | polygon | The area where the buildings or houses are constructed in a compact mass (in case of the gaps of house is less than 5 m approx.). | The area that the short side of the area is more than 10 m or equivalent should be plotted. If the specified buildings, such as government building exits in the area, buildings should be plotted independently with other code. | The edge of this area shall be plotted. The direction of plotting is clockwise. | Colour : Orange, Red | 1105 | | 6 | | 3 |
| | Construction | Building | Building, minimum | 1 | 1 | 6 / 1106 | point | The building/house that the short side less than 4 m or equivalent. | All building/house whose short side less than 4 m or eqivalent should be plotted. | The centre of the building/ house shall be plotted as a point data. | Colour : Black70%  origin — X  0.5 mm x 0.5 mm | 1106 | | 0 | | - |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.c | No. | Data Type | Definition | Acquisition Criterion | Data Acquisition Method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Construction | Building Symbol | Buddhist Temple | 1 | 2 | 1<br>**1201** | point | Temples for Buddhist | All Buddhist temple should be plotted. | The centre of the main building for Buddhist temple shall be plotted. The information will be collected by the field verificaiton/identification | Colour : Black<br>3.0m origin | 1201 | | 0 | | 1 |
| | Construction | Building Symbol | Hindu Temple (Kovil) | 1 | 2 | 2<br>**1202** | point | Temples for Hindus | All Hindu temple should be plotted. | The centre of the main building of Hindu temple shall be plotted. The information will be collected by the field verification. | Colour : Black<br>3.0m m origin | 1202 | | 0 | | 1 |
| | Construction | Building Symbol | Church | 1 | 2 | 3<br>**1203** | point | A place where Lord's Anointed has a place honour in and Christian prays. | All church should be plotted. | The centre of the main building for church shall be plotted. The information will be collected by the field verification/identification. | Colour : Black<br>3.0m origin | 1203 | | 0 | | 1 |
| | Construction | Building Symbol | Mosque | 1 | 2 | 4<br>**1204** | point | A place where Muslim pray. | All mosques should be plotted. | The centre of the main building of mosque shall be plotted. The information will be collected by the field verification/identification. | Colour : Black<br>3.0m origin | 1204 | | 0 | | 1 |
| | Construction | Building Symbol | School (elementary, junior high, high) | 1 | 2 | 5<br>**1205** | point | A place where children or student are taught. | All school (elementary, Junior high, high) should be plotted with the same symbol. | The centre of the main building for school (elementary, Junior high, high) shall be plotted. The information will be collected by the field verification/identification. | Colour : Red<br>4.0mm origin | 1205 | | 0 | | - |
| | Construction | Building Symbol | Hospital (Private,Public) | 1 | 2 | 6<br>**1206** | point | A building (private) which sick or injured people are taken care of and receive medical treatment. | All hospital (private) should be plotted. | The centre of the main building of hospital (private) shall be plotted. The information will be collected by the field verification. | Colour : Red<br>3.0m origin | 1206 | | 3 | | 5 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition Criterion | Data Acquisition Method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Construction | Building Symbol | Dispensary | 1 | 2 | 7 | point | A building which medicines are prepared and given out. | All dispensary should be plotted. | The centre of the main building of dispensary shall be plotted. The information will be collected by the field verification/identification. | Colour : Red, 2.0m, origin | 1207 | | 3 | | 3 |
| | Construction | Building Symbol | Police Station | 1 | 2 | 8 | point | A place for an official organization whose job is to make sure that people obey the law, to catch criminals, and to protect people and property. | All police station should be plotted. | The centre of the main building of police station shall be plotted. The information will be collected by the field verification/identification. | Colour : Black, origin | 1208 | | 0 | | - |
| | Construction | Building Symbol | Police Post | 1 | 2 | 9 | point | A place where police checkes people and trfic with security purposes. | All police post should be plotted. | Data will be acquired by the field identification. The centre of the main building for police post shall be plotted. | Colour : Green, 3.0mm, origin | 1209 | | 2 | | - |
| | Construction | Building Symbol | Court | 1 | 2 | 10 | point | A building where all the information concerning a crime is given so that it can be judged. | All the court post should be plotted. | Data will be acquired by the field identification/verification. The centre of the main building for court shall be plotted. | Colour : Red, 3.0mm, origin | 1210 | | 3 | | - |
| | Construction | Building Symbol | Main Post Office | 1 | 2 | 11 | point | A main place where you can buy a stamps and send letters, packages etc. | All the main post office should be plotted. | Data will be acquired in the field identification/verification. The centre of building for the main post office shall be plotted. | Colour : Red, 3.0m, origin | 1211 | | 3 | | - |
| | Construction | Building Symbol | Sub Post Office | 1 | 2 | 12 | point | A sub place where you can buy a stamps and send letters or packages etc. | All the sub post office should be plotted. | Data will be acquired in the field identification. The centre of building for the sub post office shall be plotted. | Colour : Black, 3.0m, origin | 1212 | | 0 | | - |
| | Construction | Building Symbol | Agency Post Office | 1 | 2 | 13 | point | A place | All the agency post office should be plotted. | Data will be acquired in the field identification/verification. The centre of the building for the agency post office shall be plotted. | Colour : Blue, 3.0m, origin | 1213 | | 1 | | - |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | Code Number D.C | No. | Data Type | Definition | Acquisition Criterion | Data Acquisition Method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Construction | Building Symbol | Hotel | 1 | 2 | 14 — 1214 | point | A building where people pay to spend the night stay in. | The major hotel should be plotted. | Data will be acquired in the field identification/verification. The centre of building for the hotel shall be plotted. | Colour : Black | 1214 | | 0 | | 1 |
| | Construction | Building Symbol | Rest House | 1 | 2 | 15 — 1215 | point | A place | The major rest house should be plotted. | Data will be acquired in the field identification. The centre of building for the rest house shall be plotted. | Colour : Black | 1215 | | 0 | | 1 |
| | Construction | Building Symbol | Circuit Bungalow | 1 | 2 | 16 — 1216 | point | A small house | The major circuit bungalow should be plotted. | Data will be acquired in the field identification/verification. The centre of building for the circuit bungalow shall be plotted. | Colour : Black | 1216 | | 0 | | 1 |
| | Construction | Building Symbol | Lighthouse | 1 | 2 | 17 — 1217 | point | A tower with a powerful flashing light that guides ship away from danger near the shore. | All the lighthouse should be plotted. | Data will be acquired by the field identification/verification. The centre of building for the lighthouse shall be plotted. | Colour : Black | 1217 | | 0 | | - |
| | Construction | Building Symbol | Bank | 1 | 2 | 18 — 1218 | point | A building where keeps and lends money and provides other financial services. | The major bank should be plotted. | Data will be acquired by the field identification. The centre of building for the bank shall be plotted. | Colour : Black | 1218 | | 0 | | 1 |
| | Construction | Building Symbol | Factory | 1 | 2 | 19 — 1219 | point | A building in which goods are produced in large quantities, using machines. | The major factory should be plotted. | Data will be acquired by the field identification/verification. The centre of building for the factory shall be plotted. | Colour : Black | 1219 | | 1 | | 2 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition Criterion | Data Acquisition Method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Construction | Building Symbol | Theatre/Cinema (Prominent) | 1 | 2 | 20 / 1220 | point | A building or place with a stage where plays are performed. A building in which movies are shown. | The major theatre or cinema should be plotted. | Data will be acquired by the field identification/verification. The centre of building for the theatre or cinema shall be plotted. | Colour : Green | 1220 | | 2 | | |
| | Construction | Building Symbol | Filling Station | 1 | 2 | 21 / 1221 | point | A place where you can buy oil, diesel, kerosene and petro. | The major filling station should be plotted. | Data will be acquired by the field identification/verification. The centre of building for the filling station shall be plotted. | Colour : Red | 1221 | | 3 | | - |
| | Construction | Building Symbol | Power Plant/Sub-station | 1 | 2 | 22 / 1222 | point | A building where electricity is produced to supply a large area. | All the power station/sub-station should be plotted. | Data will be acquired in the field identification. The centre of building for the power station/sub-station shall be plotted. | Colour : Red | 1222 | | 3 | | 3 |
| | Construction | Small Object | Bus Stand | 1 | 3 | 1 / 1301 | point | A place where buses start and finish their trips. | The major bus stand should be plotted. | The information will be collected in the field identification/verification. The centre of the bus stand shall be plotted. | Colour : Blue | 1301 | | 1 | | 1 |
| | Construction | Small Object | High Tower (real) | 1 | 3 | 2 / 1302 | line | A tall structure, often made of metal, used for signalling, broadcasting, supporting a high tension power line etc. | The high tower whose base is more than 10m should be plotted. | The information will be collected in the photo interpretation. The four corners of the high tower shall be plotted. | Colour : Blue | 1302 | | 1 | | 1 |
| | Construction | Small Object | High Tower (symbol) | 1 | 3 | 3 / 1303 | point | A tall structure, often made of metal, used for signalling, broadcasting, supporting a high tension power line etc. | The high tower whose base is less than 10m should be plotted. | The information will be collected by the field identification/verification. The centre of the high tower shall be plotted. | Colour : Blue | 1303 | | 1 | | - |

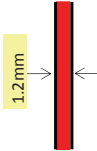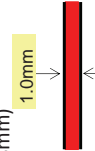| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition Criterion | Data Acquisition Method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Construction | Open Space | Stadium | 1 | 4 | 1 **1401** | line | A building for sports, consisting of a field surrounded by rows of seats. | A major stadium should be plotted. | Data will be acquired by the field identification. The boundary of stadium should be plotted. And add the annotation "Stadium". | Colour : Black, Blue  | 1401 | | 0 | | 1 |
| | Construction | Open Space | Airport | 1 | 4 | 2 **1402** | point | A place where a airplanes begin and stop flying, that has building for passengers to wait it. | All the airport should be plotted. | Data will be acquired by the photo interpretation. The centre of airport area shall be plotted. | Colour : Black  | 1402 | | 0 | | 1 |
| | Construction | Open Space | Port, Harbour | 1 | 4 | 3 **1403** | point | A place where ships can be loaded and unloaded. An area of water next to the land where the water is calm, so that ships are safe when they are inside it, and can be left there. | All the port and harbour should be plotted. | Data will be acquired by the field identification/verification. The centre of port or harbour area shall be plotted. | Colour : Black  | 1403 | | 0 | | 1 |
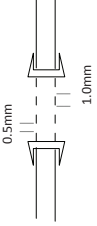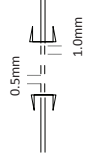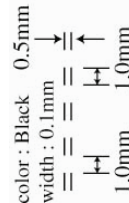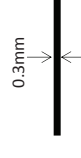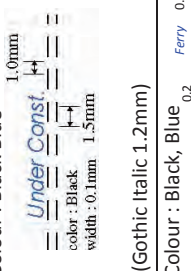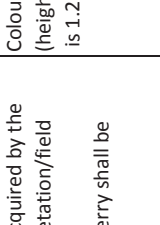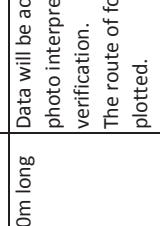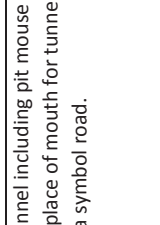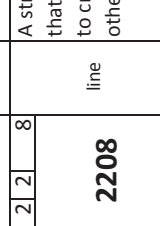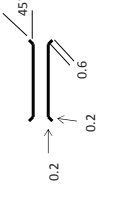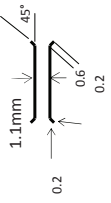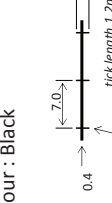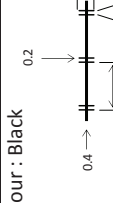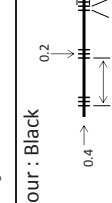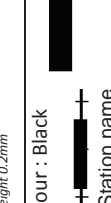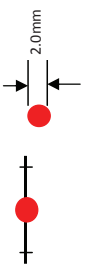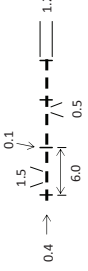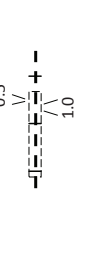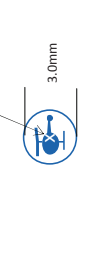
## 2.0 TRANSPORTATION, Roads

| No. | Feature Class | Data Class | Feature Name | Code Number (F.C / D.C / No.) | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer (Code / LV1 / Col / St / Lw) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Transportation, Roads | Road | Expressway (at scaled) **2101** | 2 / 1 / 1 | line | A wide road (more than 30m width) for high speed transportation. | All the expressway should be plotted. | Data will be acquired from RDA. The edge of expressway shall be plotted. The part of underground willbe shwon with hidden lines. | Colour : Black (0.2mm), Red | Code 2101 / / Col 0 / St 0 / Lw 3 |
| | Transportation, Roads | Road | Expressway (symbol) **2102** | 2 / 1 / 2 | line | A wide road (less than 30m width) for high speed transportation. | All the expressway should be plotted. | Data will be acquired from RDA. The centre of expressway shall be plotted. The part of underground willbe shwon with hidden lines. | Colour : Black (0.2mm), Red (0.8mm)  — 1.2mm | Code 2102 / / Col 0 / St / Lw 3 |
| | Transportation, Roads | Road | Main Road (A) **2103** | 2 / 1 / 3 | line | A main road (A) is defined by RDA. | All the main road (A) should be plotted. | Data will be acquired from RDA. The centre of main road (A) shall be plotted. The part of underground will be shown with hidden lines. | Colour : Black (0.1mm), Red (0.8mm)  — 1.0mm | Code 2103 / / Col 0 / St / Lw 1 |
| | Transportation, Roads | Road | Main Road (B) **2104** | 2 / 1 / 4 | line | A main road (B) is defined by RDA. | All the main road (B) should be plotted. | Data will be acquired from RDA. The centre of main road (B) shall be plotted. The part of underground will be shwon with hidden lines. | Colour : Black (0.1mm), Red (0.8mm)  — 1.0mm | Code 2104 / / Col 0 / St / Lw 1 |
| | Transportation, Roads | Road | Secondary/ Minor Road **2105** | 2 / 1 / 5 | line | | All the Secondary/minor Road should be plotted. | Data will be acquired by the photo interpretation. The centre of secondary/minor road shall be plotted. | Colour : Black (0.1mm), Yellow (0.6mm)  — 0.8mm | Code 2105 / / Col 0 / St / Lw 1 |
| | Transportation, Roads | Road | Jeep/Cars Track **2106** | 2 / 1 / 6 | line | | All the Jeep/Car Track should be plotted. | Data will be acquired by photo interpretation. The centre of jeep/car track shall be plotted. The part of underground will be expressed with hidden lines. | Colour : Black (0.1mm)  — 0.8mm | Code 2106 / / Col 0 / St / Lw 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Code Number | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Transportation, Roads | Road | Footpath | 2 | 1 | 7 | 2107 | line | | The footpath more than 100m or to connected the other road should be plotted. | Data will be acquired by the photo interpretation and the field verification. The centre of footpath shall be plotted. The part of underground is hidden lines. | Colour : Black(0.3mm) | 2107 | | 0 | 0 | 3 |
| | Transportation, Roads | Road | Road Underground (at scale) | 2 | 1 | 8 | 2108 | line | | The underground road (at scale) more than 30m long should be plotted. | Data will be acquired by photo interpretation and the field verification. The edge of underground road (at scale) shall be plotted. | Colour : Black (0.1mm) | 2108 | | 0 | 0 | 1 |
| | Transportation, Roads | Road | Road Underground | 2 | 1 | 9 | 2109 | line | | The underground road more than 30m long should be plotted. | Data will be acquired by photo interpretation and the field verification. The centre of underground road shall be plotted. | Colour : Black (0.1mm) | 2109 | | 0 | 0 | 1 |
| | Transportation, Roads | Road | Pedestrian Crossing (Underground) | 2 | 1 | 10 | 2110 | line | A underground pass for pedestrian. | The major pedestrian crossing (underground) should be plotted. | Data will be acquired by photo interpretation and field identification. The centre of pedestrian crossing (underground) shall be plotted. | Colour : Black (0.1mm) color : Black 0.5mm width : 0.1mm | 2110 | | 0 | 0 | 1 |
| | Transportation, Roads | Road facility | Road Island (separator) | 2 | 2 | 1 | 2201 | line | A raised road part in the middle of the road, separater at the center of the road, | The road island (separator) more than 100m long and 4m width should be plotted. | Data will be acquired by the photo interpretation/field verification. The centre of separator shall be plotted. | Colour : Black | 2201 | | 0 | 0 | 0 |
| | Transportation, Roads | Road facility | Kilometre Post | 2 | 2 | 2 | 2202 | point | The Markers at every 1.0km from the origin of each main road appointed by RDA. | The only existing kilometre posts will be plotted. | Data will be acquired by the field verification. The centre of Kilometre post shall be plotted. | Colour : Black | 2202 | | 0 | 0 | - |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Transportation, Roads | Road facility | Road, Under Construction | 2 | 2 | 3 | 2203 | line | The place where a road is under construct more than 100m long ranged. | The under construction road more than 100m long and 10m width should be plotted. | Data will be acquired by the photo interpretation/field verification. | Colour : Black Blue<br>Under Const.<br>color : Black width : 0.1mm  1.5mm  1.0mm<br>(Gothic Italic 1.2mm) | 2203 | | 0 | 0 | 1 |
| | Transportation, Roads | Road facility | Ferry | 2 | 2 | 4 | 2204 | line | A route of boat that carries people or goods across a river. | All ferries should be plotted. | Data will be acquired by the photo interpretation/field verification. The route of ferry shall be plotted. | Colour : Black, Blue (height of character is 1.2mm)  Ferry 0.4  0.4 | 2204 | | 0 | 0 | 3 |
| | Transportation, Roads | Road facility | Ford | 2 | 2 | 5 | 2205 | line | A route in a river that is not deep, so that you can walk or drive across. | The ford more than 100m long should be plotted. | Data will be acquired by the photo interpretation/field verification. The route of ford shall be plotted. | Colour : Black, Blue (height of character is 1.2mm)  Ford 0.4  0.4 | 2205 | | 0 | 0 | 3 |
| | Transportation, Roads | Road facility | Tunnel/Pit Mouth (at scaled) | 2 | 2 | 6 | 2206 | line | A tunnel including Pit Mouth is a place of mouth for tunnel for the road expressed with at scaled width. | All the tunnel/Pit Mouth for the road should be plotted at scale. | Data will be acquired by the photo interpretation/field verification. The edge of tunnel/pit mouth shall be plotted. | Colour : Black  0.1 | 2206 | | 0 | 0 | 1 |
| | Transportation, Roads | Road facility | Tunnel/Pit Mouth (Symbol) | 2 | 2 | 7 | 2207 | point | A tunnel including pit mouse is a place of mouth for tunnel for a symbol road. | All the tunnel/Pit Mouth for a symbol road should be plotted. | Data will be acquired by the photo interpretation/field verification. The centre of tunnel/pit mouth shall be plotted. | Colour : Black  0.1mm  1.1mm  origin | 2207 | | 0 | 0 | 1 |
| | Transportation, Roads | Road facility | Bridge (at scaled) | 2 | 2 | 8 | 2208 | line | A structure built over a river that allows people or vehicles to cross from one side to the other. | All the bridge for width road will be plotted at scale. | Data will be acquired by the photo interpretation/field verification. The edge of bridge shall be plotted. | Colour : Black  45°  0.6  0.2  0.2 | 2208 | | 0 | 0 | 1 |
| | Transportation, Roads | Road facility | Bridge (Symbol) | 2 | 2 | 9 | 2209 | line | A structure built over a river that allows people or vehicles to cross from one side to the other. | The bridge less than 20m long and 3m width for symbol road should be plotted. | Data will be acquired by the photo interpretation/field verification. The centre of bridge shall be plotted. | Colour : Black  45°  0.6  1.2mm  0.2  0.3 | 2209 | | 0 | 0 | 1 |

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Micro station layer | | | |
| | Transportation, Roads | Road facility | Overpass, Flyover (at scaled) | 2 | 2 | 10 (2210) | line | A structure built over a road or a railway that allows people or vehicles to cross from one side to the other. | All the overpass, flyover for width road should be plotted at scale. | Data will be acquired by the photo interpretation/field verification. The edge of overpass, flyover shall be plotted. | Colour : Black | 2210 | | 0 | 0 | 3 |
| | Transportation, Roads | Road facility | Overpass, Flyover (Symbol) | 2 | 2 | 11 (2211) | line | A structure built over a road or a railway that allows people or vehicles to cross from one side to the other. | The overpass, flyover less than 20m long and 3m width for symbol road should be plotted. | Data will be acquired by the photo interpretation/field verification. The centre of overpass, flyover shall be plotted. | Colour : Black | 2211 | | 0 | 0 | 3 |
| | Transportation, Roads | Road facility | Culvert | 2 | 2 | 12 (2212) | point | A water pipes pass through under crossing the road. | All culverts should be plotted. | Data will be acquired by photo interpretation/field verification. The centre of entrance or exit of culvert shall be plotted. | Colour : Black | 2212 | | 0 | 0 | 2 |
| | Transportation, Roads | Railway | Railway single track | 2 | 3 | 1 (2301) | line | Active single truck railways. | All the railway single track should be plotted. | Data will be acquired by the photo interpretation/field verification. The centre of tracks shall be plotted. | Colour : Black | 2301 | | 0 | 0 | 7 |
| | Transportation, Roads | Railway | Railway double track | 2 | 3 | 2 (2302) | line | Active double truck railways. | All the railway double track should be plotted. | Data will be acquired by the photo identification/field verification. The centre of two sets of tracks shall be plotted. | Colour : Black | 2302 | | 0 | 0 | 7 |
| | Transportation, Roads | Railway | Railway more than double track | 2 | 3 | 3 (2303) | line | More than double track railways. | All the railway more than double track should be plotted. | Data will be acquired by the photo interpretation/field verification. The centre of each tracks shall be plotted. | Colour : Black | 2303 | | 0 | 0 | 7 |
| | Transportation, Roads | Railway | Railway Station | 2 | 3 | 4 (2304) | polygon | A raised concrete structure for the passengers to get on or get off a train. | The railway platform more than 50m long should be plotted at scale. | Data will be acquired by photo interpretation. The edge of railway platform shall be plotted. | Colour : Black  Station name | 2304 | | 0 | 0 | 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Transportation, Roads | Railway | Railway Halt | 2 | 3 | 5 / 2305 | point | A place where the train stops or pause. | All the railway halts should be plotted. | Data will be acquired by the field verification. The centre of railway halt shall be plotted. | Colour : Red (2.0mm) | 2305 | | 3 | 3 | - |
| | Transportation, Roads | Railway | Abandoned Railway | 2 | 3 | 6 / 2306 | line | Railway that dose not exist or abandoned. | All the abandoned railways should be expressed | Data will be acquired by field identification/verification. The centre of railway track shall be plotted. | Colour: Black | 2306 | | 0 | | 7 |
| | Transportation, Roads | Railway | Abandoned Station | 2 | 3 | 7 / 2307 | polygon | Station that does not exist or abandoned. | All the abandoned stations should be expressed. | The edge of railway platform shall be plotted. | Colour: Black(0.1mm) | 2307 | | 0 | | 1 |
| | Transportation, Roads | Aviation | Taxiway | 2 | 4 | 1 / 2401 | polygon | The space for the aircraft access from runway to terminal or vise versa. | All the taxiway should be plotted. | Data will be acquired by the photo interpretation. The edge of taxiway shall be plotted. The direction of plotting is the clockwise. | Colour : Black (1.0mm / 1.0mm) | 2401 | | 0 | | 1 |
| | Transportation, Roads | Aviation | Runway | 2 | 4 | 2 / 2402 | polygon | The hard surface like a road which airplane take off and land. | All the runaway should be plotted. | Data will be acquired by the photo interpretation. The edge of runaway shall be plotted. The direction of plotting is the clockwise. | Colour : Black (0.5mm / 1.5mm) | 2402 | | 0 | | 1 |
| | Transportation, Roads | Aviation | Helicopter Pad | 2 | 4 | 3 / 2403 | point | A port for the helicopters lnding and take-off, on the ground or on top of a building. | All the helicopter pad should be plotted. | Data will be acquired by photo interpretation. The centre of helicopter pad shall be plotted. | Colour : Blue (3.0mm) | 2403 | | 1 | | 1 |
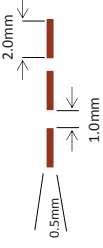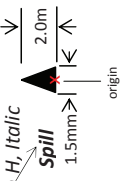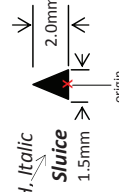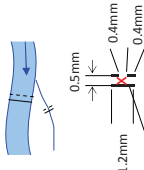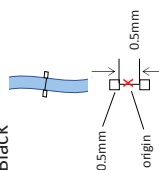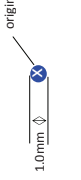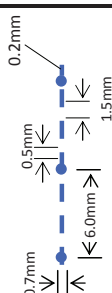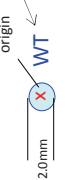
## 3.0  Hydrography

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Code Number | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrography | Water area | Shore lines | 3 | 1 | 1 | 3101 | polygon | The land at the edge of ocean. | All the shore line should be plotted. | Data will be acquired by the photo interpretation. The land along the edge of an ocean shall be plotted. | Colour : Blue 0.15mm | 3101 | | 1 | 1 | 2 |
| | Hydrography | Water area | Canals, Rivers and Streams (at scale) | 3 | 1 | 2 | 3102 | polygon | A canal is a long narrow stream to transport water. A river is a natural and continuous flow of water in a long line across a country into an ocean, lake etc. A stream is a small scaled natural water flow. It is narrower than a river. | The canal, river and stream whose width is more than 5m should be plotted. | Data will be acquired by the photo interpretation. The boundary of a canal, river and stream shall be plotted. The direction of plotting is a clockwise. The under the bridge of this features is expressed by a hidden lines. | Colour : Blue, Light Blue 0.15mm 0.15mm | 3102 | | 1 | 1 | 2 |
| | Hydrography | Water area | Canals, Rivers and Streams (symbol) | 3 | 1 | 3 | 3103 | line | - do - | The canal, river and stream that the width is less than 5m should be plotted. | Data will be acquired by the photo verification. The centre of a canal, river and stream shall be plotted. | Colour : Blue 0.15mm 0.15mm | 3103 | | 1 | 1 | 1 |
| | Hydrography | Water area | Fountainheads (spring/ fountains) | 3 | 1 | 4 | 3104 | point | A place where water comes up naturally from the ground. | The fountainhead that is identified by the field identification should be plotted. | The data will be acquired in the field verification. The centre of fountainheads shall be plotted. | Colour : Blue, Light Blue origin 1.5mm 0.2mm 2.0mm | 3104 | | 1 | 1 | 3 |
| | Hydrography | Water area | Lake | 3 | 1 | 5 | 3105 | polygon | A large area of water surrounded by land. | The lake whose size is more than 10m by 10m should be plotted. | Data will be acquired by the photo interpretation. The edge of water shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue 0.15mm | 3105 | | 1 | 1 | 3 |

(Micro station layer)

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrography | Water area | Pond | 3 | 1 | 6 / 3106 | polygon | A small fresh water area whose area is smaller than a lake. | The pond whose size is more than 10m by 10m should be plotted. | - do - | Colour : Blue, Light Blue | 3106 | | 1 | 1 | 3 |
| | Hydrography | Water area | Irrigation Canal | 3 | 1 | 7 / 3107 | line | The canal that supply land or crops with water. | The irrigation canal having more than 100m long should be plotted. The irrigation canal connected other irrigation canals whose length are less than 100m long should be plotted. | The data will be acquired by the photo interpretation and the field verification. The centre of irrigation canal shall be plotted. The direction of plotting is clockwise. | Colour : Blue | 3107 | | 1 | | 1 |
| | Hydrography | Water area | Abandoned Irrigation Canal | 3 | 1 | 8 / 3108 | line | The abandoned irrigation canal that supply land or crops with water. | The abandoned irrigation canal whose has more than 100m long should be plotted. The abandoned irrigation canal connected other abandoned irrigation canal whose has less than 100m long should be plotted. | The data will be acquired in the photo interpretation. The centre of abandoned irrigation canal shall be plotted. | Colour : Blue | 3108 | | 1 | | 1 |
| | Hydrography | Water area | Tank | 3 | 1 | 9 / 3109 | polygon | A reservoir that is associated with a dam. | The tank that is visible on the aerial photography should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of tank shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue | 3109 | | 1 | | 2 |
| | Hydrography | Water area | Abandoned Tank | 3 | 1 | 10 / 3110 | polygon | A abandoned reservoir that is associated with a dam. | The abandoned tank that is visible on the aerial photography should be plotted. | The data will be acquired by the photo interpretation. The boundary of abandoned tank shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue | 3110 | | 1 | | 25 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrography | Water area | Reservoir Area | 3 | 1 | 11 **3111** | polygon | A lake, especially an artificial one, where water is stored before it is supplied to people's houses. | The reservoir area that is visible on the aerial photography should be plotted. | The data will be acquired by the photo interpretation. The boundary of reservoir area shall be plotted. The direction of plotting is clockwise. | Colour : Blue  0.15mm | 3111 | | 1 | 1 | 3 |
| | Hydrography | Water area | Lagoon Area | 3 | 1 | 12 **3112** | polygon | An area of ocean that is not very deep, and that is almost completely separated from the ocean by rocks, sand, etc. | The lagoon area that is visible on the aerial photography should be plotted. | The data will be acquired in the photo interpretation. The boundary of lagoon area shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue  0.15mm | 3112 | | 1 | 1 | 3 |
| | Hydrography | Water area | Water Hole | 3 | 1 | 13 **3113** | polygon | A watering hole | The water hole that is visible on the aerial photography should be plotted. | The data will be acquired by the photo interpretation. The boundary of water hole shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue  0.15mm | 3113 | | 1 | 1 | 3 |
| | Hydrography | Water area | Pool | 3 | 1 | 14 **3114** | polygon | A hole that has been specially built and filled with water so that people can swim in it. | The pool that is visible on the aerial photography should be plotted. | The data will be acquired in the photo interpretation and the field verification. The boundary of pool shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue  0.2mm | 3114 | | 1 | 1 | 3 |
| | Hydrography | Water area | Villu | 3 | 1 | 15 **3115** | polygon | A villu is a kind of reservoir pond that is fulfil with water in the rainy season and supply water to cultivated areas in the dry season. | All the villu should be plotted. | The data will be acquired by the field verification. The boundary of villu shall be plotted. The direction of plotting is clockwise. | Colour : Blue, Light Blue  0.2mm → 0.8mm  1.5mm 0.1mm | 3115 | | 1 | 1 | 3 |
| | Hydrography | Water area | Anchorage Area | 3 | 1 | 16 **3116** | point | A place where ships can anchor. | All the anchorage area should be plotted. | The data will be acquired in the field verification. The centre of anchorage area shall be plotted and the boundary of area shall be also plotted with a boundary of territory/zone. | Colour : Blue  origin / circle diameter 1.0mm / 1.0mm / 1.6mm / 3.0mm | 3116 | | 1 | 1 | 3 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrography | Water area | Flow Arrow | 3 | 1 | 17 / 3117 | point | A direction of flow in a river. | The flow arrow that is identified in the field identification should be expressed. | The data will be acquired in the field verification. For river width more than 8m, A flow arrow shall be expressed at the centre of river. For single river expression, a flow arrow shall be expressed above or under a river. | Colour : Blue | 3117 | | 1 | 1 | 3 |
| | Hydrography | Water facilities | Pier-Jetty | 3 | 2 | 1 / 3201 | line | A wide built out into the water, especially so that boats can stop next to it. | The pier-jetty that has more than 10m width and 20m long should be plotted. | The data will be acquired by the field verification. The edge of pier-jetty shall be plotted. | Colour : Black | 3201 | | 0 | | 1 |
| | Hydrography | Water facilities | Wharf | 3 | 2 | 2 / 3202 | line | A structure that is built out into the water so that boats can stop next to it. | All the wharf should be plotted. | The data will be acquired in the field verification. The edge of wharf shall be plotted. | Colour : Black | 3202 | | 0 | | 1 |
| | Hydrography | Water facilities | Revetment (Retaining Wall at the coast) | 3 | 2 | 3 / 3203 | line | A surface of stone or other buildings materials that is added to give strength to a wall that holds back loose water. | The revetment whose more than 20m long should be plotted. | The data will be acquired by the field verification. The edge of revetment shall be plotted. | Colour : Black | 3203 | | 0 | | 3 |
| | Hydrography | Water facilities | Breakwater | 3 | 2 | 4 / 3204 | polygon | A large strong wall built out into the ocean to protect the shore from the force of the waves. | The breakwater that is more than 20m long should be plotted. | The data will be acquired in the field verification. The edge of breakwater shall be plotted. | Colour : Black | 3204 | | 0 | | 3 |
| | Hydrography | Water facilities | Dam | 3 | 2 | 5 / 3205 | line | A special wall built across a river, stream etc. to stop the water from flowing, especially to make a lake or produce electricity. | The dam that is visible on the aerial photography should be plotted. | The data will be acquired in the field verification. The centre of top of dam shall be plotted. | Colour : Black | 3205 | | 0 | | 9 |
| | Hydrography | Water facilities | Anicut | 3 | 2 | 6 / 3206 | point | | The anicut that is visible on the aerial photography should be plotted. | The data will be acquired in the field verification. The centre of anicut shall be plotted. | Colour : Black | 3206 | | 0 | | 9 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrography | Water facilities | Bund | 3 | 2 | 7 | 3207 | line | A wall or bank built to keep back water and prevent flooding. | All the bund should be plotted. | The data will acquired by the photo interpretation. The centre of bund shall be plotted. | Colour : Brown  0.5mm | 3207 | | 254 | | 9 |
| | Hydrography | Water facilities | Abandoned Bund | 3 | 2 | 8 | 3208 | line | An abandoned bund. | All the abandoned bund should be plotted. | The data will be acquired in the field verification. The centre of abandoned bund shall be plotted. | Colour : Brown  2.0mm 1.0mm 0.5mm | 3208 | | 254 | | 9 |
| | Hydrography | Water facilities | Spill | 3 | 2 | 9 | 3209 | point | A passage for water to flow through river, with a special gate that can be opened or closed to control the flow. | All the spill should be plotted. | The data will be acquired in the field verification. The centre of spill shall be plotted. The tip of symbol shall be connected river. | Colour : Black  12mm H. Italic  Spill  2.0m 1.5mm origin | 3209 | | 0 | 0 | |
| | Hydrography | Water facilities | Sluice | 3 | 2 | 10 | 3210 | point | A passage for water to flow through canal, with a special gate that can be opened or closed to control the flow. | All the sluice should be plotted. | The data will be acquired in the field verification. The centre of spill shall be plotted. The tip of symbol shall be connected canal. | Colour : Black  12mm H. Italic  Sluice  2.0mm 1.5mm origin | 3210 | | 0 | 0 | |
| | Hydrography | Water facilities | Weir | 3 | 2 | 11 | 3211 | point | A low structure built across a river or stream to control the flow of water. | All the weir should be plotted. | The data will be acquired by the field verification. The centre of weir shall be plotted. The break line of symbol shall be opened onto a headwaters. | Colour : Black  0.5mm 0.4mm 0.4mm 1.2mm origin | 3211 | | 0 | 0 | 1 |
| | Hydrography | Water facilities | Flood Gate | 3 | 2 | 12 | 3212 | point | A gate used to control the flow of the water from river. | All the flood gates should be plotted. | The data will be acquired by the field verification. The centre of flood gate shall be plotted. The symbol shall be expressed perpendicular with a river. | Colour : Black  0.5 x 0.5mm 0.5mm origin | 3212 | | 0 | 0 | 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrography | Water facilities | Well | 3 | 2 | 13 | 3213 | point | A deep hole in the ground from which people take water. | All the well should be plotted. | The data will be acquired by the field verification. The centre of well shall be plotted. | Colour : Blue | 3213 | | 1 | | - |
| | Hydrography | Water facilities | Water Tunnel | 3 | 2 | 14 | 3214 | line | A passage that has been dug under the ground, through a mountain etc, for water. | The water tunnel that is identify in the field identification or in the document from a relevant organization shall be plotted. | The data will be acquired by the field verification. The centre of water tunnel shall be plotted. | Colour : Blue | 3214 | | 1 | | 3 |
| | Hydrography | Water facilities | Water Tank | 3 | 2 | 15 | 3215 | point | A large container for storing water. | The water tank that has more than 10m diameter be plotted. | The data will be acquired by the photo interpretation. The centre of water tank shall be plotted. | Colour : Blue, Light Blue | 3215 | | 1 | | - |
| | Hydrography | Water facilities | Water Fall | 3 | 2 | 16 | 3216 | point | A place where water falls straight down over a cliff or rock. | The water fall that is identify in the field identification should be plotted. | The data will be acquired in the field verification. The top and centre of waterfall shall be plotted. | Colour : Blue | 3216 | | 1 | | - |
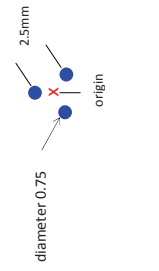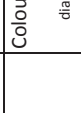
**Map symbols for 1:10,000 scale Digital Topographic Map**

## 4.0 Associated Features
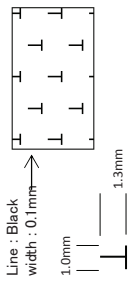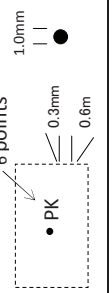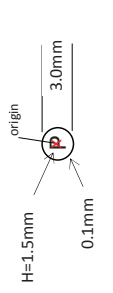
| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Associated Features | Utility | Gas/Oil Tank | 4 | 1 | 1 / 4101 | line | A large container for storing gas or oil. | The diameter of tank more than 20m should be plotted. | The data will be acquired by the photo identification . The edge of tank shall be plotted. | Colour : Black | 4101 |  | 0 | 0 | 2 |
|  | Associated Features | Utility | High Tension Line | 4 | 1 | 2 / 4102 | line | A wires, lines that have a powerful electric current going through them. | The high tension line more than 33Kv should be plotted. | The data will be acquired by the photo interpretation/field verification and the electric company. The connected line between the power transmission towers shall be plotted. | Colour : Black | 4102 |  | 0 |  | 3 |
|  | Associated Features | Utility | Transformer | 4 | 1 | 3 / 4103 | point | A piece of equipment for changing electricity from one voltage to another. | The transformer with high tension line more than 33Kv should be plotted. | The data will be acquired by the field verification and the electric company. The centre of transformer shall be plotted. | Colour : Black | 4103 |  | 0 |  | - |
|  | Associated Features | Special Place | Mine or Quarry | 4 | 2 | 1 / 4201 | point | The place to dig into the ground in order to get gold, coal etc. The place to dig out stone, sand etc. | All mines or quarries should be expressed. | The data will be acquired by the field verification. The centre of mine or quarry area shall be plotted. The boundary shall be plotted with 6102, if needed. | Colour : Blue (0.15mm) | 4201 |  | 1 | 1 | 1 |
|  | Associated Features | Special Place | Historical Sites | 4 | 2 | 2 / 4202 | point | The structure that is very famous memorial monument statue and memorial tower. | All historical sites should be expressed. | The data will be acquired by the field verification/photo interpretation. The centre of historical site or structure shall be plotted. The boundary shall be plotted with 6102, if needed. | Colour : Red | 4202 |  | 3 | 3 | - |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Archaeological Site | 4 | 2 | 3 — 4203 | point | A place where remains ancient buildings, graves and tools etc. | All archaeological sites should be expressed. | The data will be acquired by the field verification. The centre of archaeological site or structure shall be plotted. The boundary shall be plotted with 6102, if needed. | Colour : Blue  diameter 0.75  2.5mm  origin | 4203 | | 1 | | - |
| | Associated Features Special Place | | | | | | | | | | | | | | | |
| | | | Indicator Point | 4 | 3 | 1 — 4301 | point | The point that is indicated a certain feature. | | | Colour : Black  diameter 0.2 mm | 4301 | | 0 | | - |
| | Associated Features Special Point | | | | | | | | | | | | | | | |

## 5.0 Land Classification (Open Space)
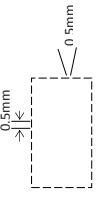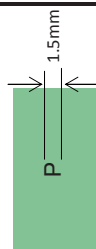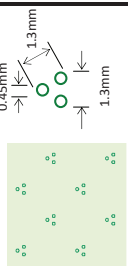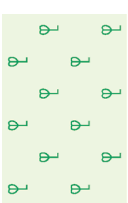
| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Land Classification (Open Space) | Facility Space | Park | 5 | 1 | 1 | polygon | A large open space with grass and trees, especially in a city, where people can walk, play games etc. | The park more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation/field verification. The boundary of park shall be plotted. | Colour : Green, Black, C20%Y20%  Line : Black width : 0.1mm  0.3m  0.6m  C20%Y20% | 5101 | | 2 | |
| | Land Classification (Open Space) | Facility Space | Play Ground | 5 | 1 | 2 | polygon | A piece of ground for children to play on, especially at school or in a park. | The play ground more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation. The boundary of play ground shall be plotted. | Colour : Light Green(C30%Y30%)  Line : Black width : 0.3m  0.6m | 5102 | | 2 | |
| | Land Classification (Open Space) | Facility Space | Homesteads/Garden | 5 | 1 | 3 | polygon | The part of a piece of land around or next to your house that has flowers and plants in it. | The homesteads/garden more than 50m by 50m should be plotted. | The data will be acquired by the photo interpretation. The boundary of homesteads/garden shall be plotted. | Colour : Brown50%  width : 0.1mm  Brown 50% | 5103 | | 2 | |
| | Land Classification (Open Space) | Farm | Aquatic Farm (Fish Farm) | 5 | 2 | 1 | polygon | A place where fish are bred as a business. | The aquatic farm more than 100m by 100m should be plotted. | The data will be acquired photo interpretation/field verification. The boundary of aquatic farm shall be plotted. | Colour : Blue, C20%  Line : Blue width : 0.1mm  C 20% | 5201 | | 1 | |
| | Land Classification (Open Space) | Farm | Agricultural Farm | 5 | 2 | 2 | polygon | A place where agricultural produces are produced as a business. | The agricultural farm more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation/field verification. The boundary of agricultural farm shall be plotted. | Colour : Green  Line : Green width : 0.1mm | 5202 | | 245 | |
| | Land Classification (Open Space) | Farm | Livestock Farm | 5 | 2 | 3 | polygon | A place where the animals are kept as a business. | The livestock more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation/field verification. The boundary of livestock farm shall be plotted. | Colour : Black  Line : Black width : 0.1mm  1.0mm | 5203 | | 245 | |

| | | | 5 | 3 | 1 | | | | | | 5301 | 1 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Classification (Open Space) | Religious Space | Cemetery | **5301** | | polygon | An area of land where dead people are buried. | The cemetery more than 50m by 50m should be plotted. | The data will be acquired by photo interpretation/field verification. The boundary of cemetery shall be plotted. | Colour : Black<br>Line : Black<br>width : 0.1mm →<br>1.0mm 1.3mm | 5301 | 1 | 3 |
| | | | 5 | 4 | 1 | | | | | | 5401 | 0 | |
| Land Classification (Open Space) | Park Space | Car Park 1 | **5401** | | polygon | An enclosed area in a public place for cars to be parked in. | The car park 1 more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation/field verification. The boundary of car park area 1 shall be plotted. | Colour : Black<br>6 points 1.0mm<br>• PK 0.3mm 0.6m ● | 5401 | 0 | |
| | | | 5 | 4 | 2 | | | | | | 5402 | BG | |
| Land Classification (Open Space) | Park Space | Car Park 2 | **5402** | | point | An enclosed building in a public place for cars to be parked in. | The car park 2 building has more than 3 stories. | The data will be acquired by the field verification. The centre of park building shall be plotted. | Colour : Black<br>H=1.5mm origin P 3.0mm 0.1mm | 5402 | BG | |
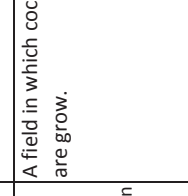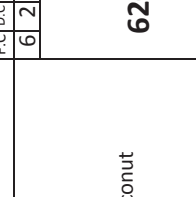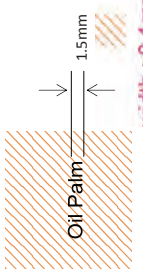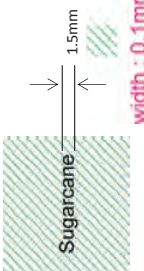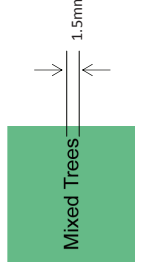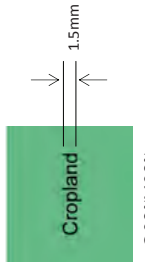
**Map symbols for 1:10,000 scale Digital Topographic Map**
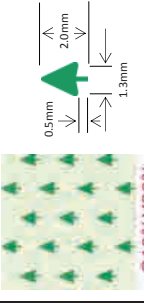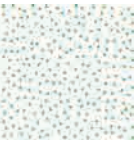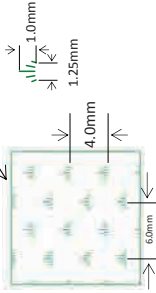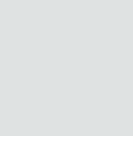
## 6.0 Vegetation
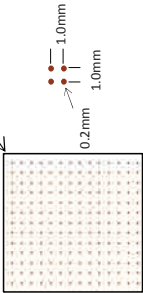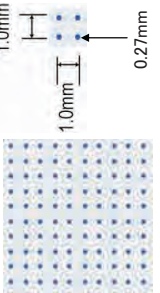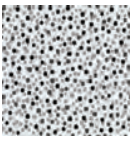
| No. | Feature Class | Data Class | Feature Name | Code Number (F.C / D.c / No.) | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer (Code / LV1 / Col / St / Lw) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vegetation | Vegetation Boundary | Vegetation Boundary | 6 / 1 / 1 — 6101 | line | A real or imaginary line that marks where one area of vegetation is separate from other vegetation area. | The both vegetation areas are more than 100m by 100m area, then the vegetation boundary should be plotted, if needed. | The data will be acquired by the photo interpretation and the field verification. The centre of vegetation boundary shall be plotted. | Colour : Green (0.1mm) | Code 6101, Col 2, Lw 1 |
| | Vegetation | Vegetation Boundary | Boundary of Territory/Zone | 6 / 1 / 2 — 6102 | line | A real or imaginary line that marks where a special area ( for example, mine) is identified. | The territory/zone are more than 100m by 100m area, then the boundary should be plotted, if needed. | The data will be acquired by the photo interpretation and the field verification. The centre of boundary of territory/zone shall be plotted. | Colour : Black (0.1mm)  0.5mm  0.5mm | Code 6102, Col 0, Lw 1 |
| | Vegetation | Vegetation | Paddy | 6 / 2 / 1 — 6201 | Polygon | A field in which rice is grow in water. | The paddy field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of paddy field shall be plotted. The direction of plotting is always clockwise. | Colour : Green40%, Black   P  1.5mm   C40%Y40% | Code 6201, Col 2, Lw 1 |
| | Vegetation | Vegetation | Tea | 6 / 2 / 2 — 6202 | Polygon | A field in which teas are grow. | The tea field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of tea field shall be plotted. The direction of plotting is always clockwise. | Colour : Green, C10%Y20%   0.45mm  1.3mm  1.3mm | Code 6202, Col 2, Lw 1 |
| | Vegetation | Vegetation | Rubber | 6 / 2 / 3 — 6203 | Polygon | A field in which rubber trees are grow. | The rubber field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of rubber field shall be plotted. The direction of plotting is always clockwise. | Colour : Green, C10%Y20% | Code 6203, Col 2, Lw 1 |

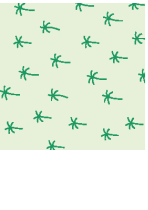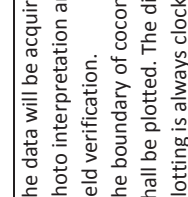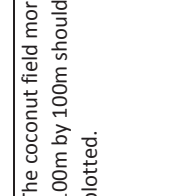| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vegetation | Vegetation | Coconut | 6 | 2 | 4 | Polygon | A field in which coconut trees are grow. | The coconut field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of coconut field shall be plotted. The direction of plotting is always clockwise. | Colour : Green, C10%Y20% | 6204 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Cinnamon | 6 | 2 | 5 | Polygon | A field in which cinnamons are grow. | The cinnamon field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of cinnamon field shall be plotted. The direction of plotting is always clockwise. | Colour : C70%Y70%, Black | 6205 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Citronella | 6 | 2 | 6 | Polygon | A field in which citronellas are grow. | The citronella field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of citronella field shall be plotted. The direction of plotting is always clockwise. | Colour : M55%Y75%, Black | 6206 | | 3 | 2 | 1 |
| | Vegetation | Vegetation | Cashew | 6 | 2 | 7 | Polygon | A field in which cashews are grow. | The cashew field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of cashew field shall be plotted. The direction of plotting is always clockwise. | Colour : C70%Y70%, Black | 6207 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Palmyra | 6 | 2 | 8 | Polygon | A field in which Palmiras are grow. | The Palmyra field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of Palmyra field shall be plotted. The direction of plotting is always clockwise. | Colour : Black80%, C10%Y20% | 6208 | | 2 | 2 | 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | (big) | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vegetation | Vegetation | Oil Palm | 6 | 2 | 9 | 6209 | Polygon | A field in which oil palms are grow. | The oil palm field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of oil palm field shall be plotted. The direction of plotting is always clockwise. | Colour : M55%Y75%, Black — Oil Palm — 1.5mm — width : 0.1mm M55% Y75% | 6209 | | 3 | 3 | 1 |
| | Vegetation | Vegetation | Sugarcane | 6 | 2 | 10 | 6210 | Polygon | A field in which sugarcanes are grow. | The sugarcane field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of sugarcane field shall be plotted. The direction of plotting is always clockwise. | Colour : C70%Y70%, Black — Sugarcane — 1.5mm — width : 0.1mm C70% Y70% | 6210 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Other Cultivations | 6 | 2 | 11 | 6211 | Polygon | A field in which other plants are grow. | The other cultivations field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of other cultivations field shall be plotted. The direction of plotting is always clockwise. | Colour : Yellow Green(C30%Y60%) — C30%Y60 | 6211 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Mixed Trees and Other perennial crops | 6 | 2 | 12 | 6212 | Polygon | A field in which mixed trees and other perennial crops are grow. | The mixed trees and other perennial crops field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of mixed trees and other perennial crops field shall be plotted. The direction of plotting is always clockwise. | Colour : Green60%, Black — Mixed Trees — 1.5mm — C60%Y60% | 6212 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Sparsely used for cropland | 6 | 2 | 13 | 6213 | Polygon | A field in which used for cropland sparsely. | The sparsely used for cropland more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of sparsely used for cropland field shall be plotted. The direction of plotting is always clockwise. | Colour : Green60%, Black — Cropland — 1.5mm — C60%Y60% | 6213 | | 2 | 2 | 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vegetation | Vegetation | Open Forest | 6 | 2 | 14 | Polygon | A field in which trees are grow. | The open forest field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of open forest field shall be plotted. The direction of plotting is always clockwise. | Colour : Light Green(C30%Y30%) | 6214 | | 2 | 2 | 1 |
| | Vegetation | Vegetation | Forest Plantation | 6 | 2 | 15 | Polygon | A field in which specified trees are planted. | The forest plantation field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of forest plantation field shall be plotted. The direction of plotting is always clockwise. | Colour : Green, C10%Y20% | 6215 | | 2 | | 1 |
| | Vegetation | Vegetation | Forest | 6 | 2 | 16 | Polygon | A field in which trees are glow. | The forest field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of forest field shall be plotted. The direction of plotting is always clockwise. | Colour : Green80%, Light Green | 6216 | | 2 | | 1 |
| | Vegetation | Vegetation | Chena | 6 | 2 | 17 | Polygon | A field in which chena are glow. | The chena field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of chena field shall be plotted. The direction of plotting is always clockwise. | Colour : Brown | 6217 | | 254 | | 1 |
| | Vegetation | Vegetation | Mangrove | 6 | 2 | 18 | Polygon | A field in which mangroves are glow. | The mangrove field more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of mangrove field shall be plotted. The direction of plotting is always clockwise. | Colour : Green80%, C5% Line : Black width : 0.1mm | 6218 | | 2 | | 1 |

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Micro station layer | | | |
| | Vegetation | Vegetation | Swamp | 6 | 2 | 19 / 6219 | Polygon | A large area of low wet land near a river, where wild plants and trees grow. | The swamp area more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of swamp area shall be plotted. The direction of plotting is always clockwise. | Colour : C75%M25%, C5%  Line : Blue width : 0.1mm | 6219 | | 1 | | 1 |
| | Vegetation | Vegetation | Marsh | 6 | 2 | 20 / 6220 | Polygon | An area of low wet ground, often between the ocean and land, in which grasses or bushed may grow. | The marsh area more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of marsh area shall be plotted. The direction of plotting is always clockwise. | Colour :C50%  Line : Blue width : 0.1mm | 6220 | | 1 | | 1 |
| | Vegetation | Vegetation | Scrub land | 6 | 2 | 21 / 6221 | Polygon | A field in which low trees are glow. | The scrub land more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of scrub land shall be plotted. The direction of plotting is always clockwise. | Colour : Green | 6221 | | 2 | | 1 |
| | Vegetation | Vegetation | Grass land | 6 | 2 | 22 / 6222 | Polygon | A field in which grasses are glow. | The grass land more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of grass land shall be plotted. The direction of plotting is always clockwise. | Colour : Green  Line : Green width : 0.1mm  1.0mm 1.25mm 4.0mm 6.0mm | 6222 | | 2 | | 1 |
| | Vegetation | Vegetation | Barren land | 6 | 2 | 23 / 6223 | Polygon | Land that is barren has no plants growing on it. | The barren land more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of barren land shall be plotted. The direction of plotting is always clockwise. | Colour : C15%M10%Y10% | 6223 | | 6 | | 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vegetation | Vegetation | Sand | 6 | 2 | 24 | Polygon **6224** | A areas where are covered by sand. | The sand area more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of sand area land shall be plotted. The direction of plotting is always clockwise. | Colour : Brown  | 6224 | | 254 | | 1 |
| | Vegetation | Vegetation | Salt pan area | 6 | 2 | 25 | Polygon **6225** | A areas where are fulfilled with a marine water to produce a salt. | The salt pan area more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of salt pan area shall be plotted. The direction of plotting is always clockwise. | Colour:Blue,LightGray(C10%M5%Y5%)  | 6225 | | 1 | | 1 |
| | Vegetation | Vegetation | Rock | 6 | 2 | 26 | Polygon **6226** | A areas where a lot of rocks are scattered. | The rock area more than 100m by 100m should be plotted. | The data will be acquired by the photo interpretation and the field verification. The boundary of rock area shall be plotted. The direction of plotting is always clockwise. | Colour : Black etc.  | 6226 | | 0 | | 1 |

**Map symbols for 1:10,000 scale Digital Topographic Map**
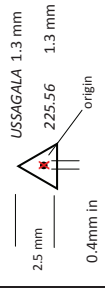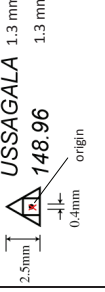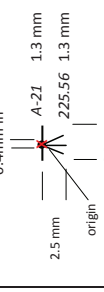
## 7.1 Topographic Features_Contour lines

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Topographic Features | Contour Lines | Index Contour Line | 7 | 1 | 1 (7101) | line | A line on a map that connects points of equal every 25m height above mean sea level. | The contour line every 25m height above mean sea level that is identified clearly should be plotted. | The point that has equal every 25m height shall be plotted. | Colour : Brown (0.25mm) | 7101 | | 254 | | 4 |
| 2 | Topographic Features | Contour Lines | Index Contour Line (Uncertain) | 7 | 1 | 2 (7102) | line | A line on a map that connects uncertain points of equal every 25m height above mean sea level. | The uncertain contour line every 25m height above mean sea level that is identified unclearly should be plotted. | The uncertain point that has equal every 25m height shall be plotted. | Colour : Brown (0.25mm) | 7102 | | 254 | | 1 |
| 3 | Topographic Features | Contour Lines | Intermediate Contour Line | 7 | 1 | 3 (7103) | line | A line on a map that connects points of equal every 5m height above mean sea level. | The contour line every 5m height above mean sea level that is identified clearly should be plotted. | The point that has equal every 5m height shall be plotted. | Colour : Brown (0.1mm) | 7103 | | 254 | | 1 |
| 4 | Topographic Features | Contour Lines | Intermediate Contour Line (Uncertain) | 7 | 1 | 4 (7104) | line | A line on a map that connects uncertain points of equal every 5m height above mean sea level. | The uncertain contour line every 5m height above mean sea level that is identified unclearly should be plotted. | The uncertain point that has equal every 5m height shall be plotted. | Colour : Brown (0.1mm) | 7104 | | 254 | | 1 |
| 5 | Topographic Features | Contour Lines | Supplementary Contour Line | 7 | 1 | 5 (7105) | line | A line on a map that connects points of equal every 2.5m height above mean sea level. | The contour line every 2.5m height above mean sea level should be plotted so that the flat terrain is expressed in detail on the map. | The point that has equal every 2.5m height shall be plotted in the relative flat area. | Colour : Brown (0.1mm) | 7105 | | 254 | | 2 |
| 6 | Topographic Features | Contour Lines | Bathymetric Contour Line (Depth Contour Lines) | 7 | 1 | 6 (7106) | line | A line on a bathymetric image that connects points of equal depth below mean sea level. | The bathymetric contour should be digitized based on the bathymetric images. | The bathymetric images will be acquired from collected data of related office. The centre of each bathymetric contour shall be digitized. | Colour : Blue (0.1mm) | 7106 | | 1 | | 1 |
| 7 | Topographic Features | Contour Lines | Depression, Index Contour Line | 7 | 1 | 7 (7107) | polygon | A part of a surface that is deeper or lower than the other parts. A contour interval is 25m. | The depression that is more than 100m by 100m should be plotted. | The data will be acquired by the 3D plotting. The depression index contour line shall be plotted. The direction of plotting is clockwise. | Colour : Brown (0.25mm) | 7107 | | 254 | | 4 |

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Topographic Features | Contour Lines | Depression, Intermediate Contour Line **7108** | 7 | 1 | 8 | polygon | A part of a surface that is deeper or lower than the other parts. A contour interval is 5m. | The depression that is more than 100m by 100m should be plotted. | The data will be acquired by the 3D plotting. The depression intermediate contour line shall be plotted. The direction of plotting is clockwise. | Colour : Brown (0.15mm)  tick line width 0.15mm; length 0.5 mm; spacing 3.0 mm; contour line width 0.15mm | 7108 | | 254 | | 2 |
| | Topographic Features | Slope Structure | Embankment (artificial slope) **7201** | 7 | 2 | 1 | line | A wide wall of earth or stones built to stop water from flooding an area or to support a road or railroad. | The embankment that is more than 100m long should be plotted. | The data will be acquired by the field verification. The edge of top embankment shall be plotted. The direction of plotting is as follows, The lower side is always right side while plotting. | Colour : Black  original  0.5mm  0.8mm | 7201 | | 0 | | - |
| | Topographic Features | Slope Structure | Cutting (artificial slope) **7202** | 7 | 2 | 2 | line | | The cutting that is more than 100m long should be plotted. | The data will be acquired by the field verification. The edge of top cutting shall be plotted. The direction of plotting is as follows, The lower side is always right side while plotting. | Colour : Black  original  0.5mm  0.5mm  0.5mm | 7202 | | 0 | | - |
| | Topographic Features | Sea Feature | Reef/Coral **7301** | 7 | 3 | 1 | line | A line of sharp rocks, often made of coral, or a raised area of sand near the surface of the ocean. | The reef, coral that is more than 100m long should be plotted. | The data will be acquired by the field verification. The edge of reef/coral shall be plotted. The direction of plotting is as follow, the sea side is always right side while plotting. | Colour : Blue (0.1mm)  original  0.5  1.3  0.4 | 7301 | | 1 | 1 | 1 |

## 7.2 Topographic Features_Control Points
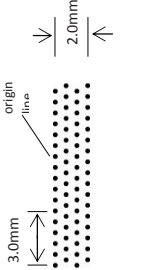
| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Micro station layer | | | | |
| | Topographic Feature | Control Point | Trigonometric Station | 7 | 4 | 1 **7401** | point | | The existed trigonometrical station should be plotted. | The data will be acquired in SDSL. The result of trigonometric station data will be provided by SDSL. The centre of trigonometrical station shall be plotted based on the coordinates of point. | Colour : Black (0.15mm) | 7401 | | 0 | 0 | 2 |
| | Topographic Feature | Control Point | Primary Triangulation Point | 7 | 4 | 2 **7402** | point | | The existed primary triangulation point should be plotted. | The data will be acquired in SDSL. The result of primary triangulation point will be provided by SDSL. The centre of primary triangulation point shall be plotted based on the coordinates of point. | Colour : Black (0.15mm) | 7402 | | 1 | 1 | 2 |
| | Topographic Feature | Control Point | Fundamental Benchmark | 7 | 4 | 3 **7403** | point | | The existed fundamental benchmark should be plotted. | The data will be acquired by the field verification and in SDSL. The result of fundamental benchmark will be provided by SDSL. The centre of fundamental benchmark shall be plotted. | Colour : Black (0.2mm) | 7403 | | 1 | 1 | 3 |
| | Topographic Feature | Control Point | Spot Height | 7 | 4 | 4 **7404** | point | The point whose has a height value by photogrammetric measurement. | The spot height is located in the following area, top of mountain, saddle, road crossing, etc. The density is 9 points per 10cm x10cm including other elevation point and contour height value. | A photogrammetric measurement will be applied as a acquisition method. | Colour : Brown | 7404 | | 254 | | |

**Map symbols for 1:10,000 scale Digital Topographic Map**

## 8.0 Boundaries

| No. | Feature Class | Data Class | Feature Name | Code Number (F.C / D.C / No.) | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boundary | Administrative Boundary | National Boundary | 8 1 1 / 8101 | line | A real or imaginary line that marks where one area of nation is separate from other nation area. | All nation boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of national boundary shall be plotted. | Colour : Red (0.25mm) | 8101 | | 3 | 3 | 4 |
| Boundary | Administrative Boundary | Provincial Boundary | 8 1 2 / 8102 | line | A real or imaginary line that marks where one area of province is separate from other province area. | All provincial boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of provincial boundary shall be plotted. | Colour : Red (0.15mm) | 8102 | | 3 | 3 | 2 |
| Boundary | Administrative Boundary | District Boundary | 8 1 3 / 8103 | line | A real or imaginary line that marks where one area of district is separate from other district area. | All district boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of district boundary shall be plotted. | Colour : Red (0.15mm) | 8103 | | 3 | 3 | 2 |
| Boundary | Administrative Boundary | Divisional Secretary's Division Boundary | 8 1 4 / 8104 | line | A real or imaginary line that marks where one area of divisional secretary's is separate from other divisional secretary's division area. | All divisional secretary's division boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of divisional secretary's division boundary shall be plotted. | Colour : Red (0.2mm) | 8104 | | 3 | 3 | 3 |
| Boundary | Administrative Boundary | Grama Niladhari Division Boundary | 8 1 5 / 8105 | line | A real or imaginary line that marks where one area of Grama Niladhari is separate from other Grama Niladhari division area. | All grama niladhari division boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of grama niladhari division boundary shall be plotted. | Colour : Red (0.15mm) | 8105 | | 3 | 3 | 1 |
| Boundary | Administrative Boundary | Municipal/ Urban Council Boundary | 8 1 6 / 8106 | line | A real or imaginary line that marks where one area of municipal/urban council is separate from other municipal/urban council. | All municipal/urban council boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of municipal/urban council boundary shall be plotted. | Colour : Purple (0.15mm) | 8106 | | 253 | | 1 |

| No. | Feature Class | Data Class | Feature Name | Code Number | | | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer | | | | |
| | | | | F.C | D.C | No. | | | | | | Code | LV1 | Col | St | Lw |
| | Boundary | Administrative Boundary | Forest Reservation, Sanctuary Wildlife, National Park Boundary | 8 | 1 | 7 **8107** | line | A real or imaginary line that marks where one area of Forest Reservation, Sanctuary Wildlife, National Park is separate from other Forest Reservation, Sanctuary Wildlife, National Park. | All Forest Reservation, Sanctuary Wildlife, National Park boundary except undetermined part of boundary should be plotted. | The data will be acquired from the government office. The centre of forest reservation, sanctuary wildlife, national park boundary shall be plotted. The direction of plotting is a clockwise. | Colour : Black  | 8107 | | 0 | | - |

## 9.0 Toponymy

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Code Number | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Micro station layer | | | | |
| 1 | Toponymy | Construction name | Government and municipal office name | 9 | 1 | 1 | 9101 | text | A name of government and municipal office. | The major office should be expressed. | The data will be acquired by the field verification. The name shall be plotted inside of building for office or appropriate place. | Colour : Black Arial Regular (1.5mm) Office name | 9101 | | 0 | 0 | |
| 2 | Toponymy | Construction name | Post office name | 9 | 1 | 2 | 9102 | text | A name of all kind of post office. | The major post office should be expressed. | The data will be acquired by the field verification. The centre of building for post office shall be plotted. | Colour : Black Arial Regular (1.5mm) Post | 9102 | | 0 | | |
| 3 | Toponymy | Construction name | Medical facilities name | 9 | 1 | 3 | 9103 | text | A name of all kind of medical facilities, for example hospital, dispensary. | The major medical facilities should be expressed. | The data will be acquired by the field verification. The centre of building for medical facility shall be plotted. | Colour : Black Arial Regular (1.5mm) Medical | 9103 | | 0 | | |
| 4 | Toponymy | Construction name | Private office name | 9 | 1 | 4 | 9104 | text | A name of private office. | The major private office should be expressed. | The data will be acquired by the field verification. The centre of building for private office shall be plotted. | Colour : Black Arial Regular (1.5mm) Private | 9104 | | 0 | | |
| 5 | Toponymy | Construction name | Diplomatic facility name | 9 | 1 | 5 | 9105 | text | A name of diplomatic facility, for example embassy. | All the diplomatic facilities should be expressed. | The data will be acquired by the field verification. The centre of building for diplomatic facility shall be plotted. | Colour : Black Arial Regular (1.5mm) Diplomatic | 9105 | | 0 | | |
| 6 | Toponymy | Construction name | Fire station name | 9 | 1 | 6 | 9106 | text | A name of fire station. | All the fire stations should be expressed. | The data will be acquired by the field verification. The centre of building for fire station shall be plotted. | Colour : Black Arial Regular (1.5mm) Fire station | 9106 | | 0 | | |
| 7 | Toponymy | Construction name | Educational facility name | 9 | 1 | 7 | 9107 | text | A name of educational facility, for example school, university, collage. | All the educational facilities should be expressed. | The data will be acquired by the field verification. The centre of building for educational facility shall be plotted. | Colour : Black Arial Regular (1.5mm) School | 9107 | | 0 | | |

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | Code Number | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Toponymy | Construction name | Aviation name | 9 | 1 | 8 | 9108 | text | A name of aviation facility, for example airport. | All the aviation facilities should be expressed. | The data will be acquired by the field verification. The centre of building for aviation facility shall be plotted. | Colour : Black (2.0mm) Arial Regular — Air port | 9108 | | 0 | 0 | |
| | Toponymy | Construction name | Common building name | 9 | 1 | 9 | 9109 | text | A common name of building. | A major common building name should be expressed. | The data will be acquired by the field verification. The centre of building for major common building shall be plotted. | Colour : Black (1.5mm) Arial Regular — Common building | 9109 | | 0 | | |
| | Toponymy | Transportation and Road name | Road name (A, B) | 9 | 2 | 1 | 9201 | text,point | A name of main road A, B. | All main road A and B name/number should be expressed. | The data will be acquired by the document from RDA (Road Development Authority). The centre of targeted road be plotted. | Colour : Black, Red Arial Italic(1.5mm) — A010  5.5mm  3.7mm | 9201 | | | | |
| | Toponymy | Transportation and Road name | Other road name and junction name | 9 | 2 | 2 | 9202 | text | A name of other road and the junction | A major other road name and a prominent junction in the main road should be expressed. | The data will be acquired by the field verification. | Colour : Black (1.5mm) Arial Regular — Other road  Kekira Handiya | 9202 | | 0 | | |
| | Toponymy | Transportation and Road name | Railway station, Railway halt name | 9 | 2 | 3 | 9203 | text | A name of railway station/halt. | All railway station/ halt name should be expressed. | The data will be acquired by the field verification. | Colour : Black Arial Regular — Colombo | 9203 | | 0 | | |
| | Toponymy | Hydrology | Ocean, Sea name | 9 | 3 | 1 | 9301 | text | A name of ocean, sea | The name of ocean, sea should be expressed along the feature. | The data will be acquired by the field verification. | Colour : Blue Arial Italic (3.0, 2.0, 1.5mm) — INDIAN OCEAN INDIAN OCEAN INDIAN OCEAN | 9301 | | 1 | | |
| | Toponymy | Hydrology | River, Stream name | 9 | 3 | 2 | 9302 | text | A name of river, stream | The name of major river, stream should be expressed along the feature. | The data will be acquired by the field verification. | Colour : Blue Arial Italic (1.5mm) — Yoda Ela | 9302 | | 1 | | |
| | Toponymy | Hydrology | Canal name | 9 | 3 | 3 | 9303 | text | A name of canal | The name of major canal should be expressed. | | Colour : Blue Arial Italic (1.5mm) — Canal | 9303 | | 1 | | |
| | Toponymy | Hydrology | Lake name | 9 | 3 | 4 | 9304 | text | A name of lake | The name of major lake should be expressed. | | Colour : Blue Arial Italic (3.0mm,2.0mm,1.5mm) — Lake Lake Lake | 9304 | | 1 | | |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Toponymy | Hydrology | Pond name | 9 | 3 | 5 / 9305 | text | A name of pond | The name of major pond should be expressed. | The name will be expressed by the centre of feature in principal. | Colour : Blue Arial Italic (1.5mm) *Pond* | 9305 | | 1 | 1 | |
| | Toponymy | Hydrology | Water fall name | 9 | 3 | 6 / 9306 | text | A name of water fall | The name of major water fall should be expressed. | The name will be expressed by the centre of feature in principal. | Colour : Blue Arial Italic (1.5mm) *Water fall* | 9306 | | 1 | | |
| | Toponymy | Hydrology | Dam (including Anicut, Tank, Abandoned Tank) name | 9 | 3 | 7 / 9307 | text | A name of dam (including Anicut, Tank, Abandoned Tank) | The name of major dam (including Anicut, Tank, Abandoned Tank) should be expressed. | The name will be expressed along the feature. | Colour : Blue Arial Italic (1.5mm) *Kuda Weda* | 9307 | | 1 | | |
| | Toponymy | Hydrology | Reservoir name | 9 | 3 | 8 / 9308 | text | A name of reservoir | The name of major reservoir should be expressed. | The name will be expressed by the centre of feature in principal. | Colour : Blue Arial Italic (1.5mm) *Reservoir* | 9308 | | 1 | | |
| | Toponymy | Hydrology | Lagoon name | 9 | 3 | 9 / 9309 | text | A name of lagoon | The name of major lagoon should be expressed. | The name will be expressed by the centre of feature in principal. | Colour : Blue Arial Italic (2.5mm) | 9309 | | 1 | | |
| | Toponymy | Hydrology | Cape name | 9 | 3 | 10 / 9310 | text | A name of cape | The name of major cape should be expressed. | | Colour : Blue Arial Italic (1.5mm) *Cape* | 9310 | | 1 | | |
| | Toponymy | Hydrology | Point name | 9 | 3 | 11 / 9311 | text | A name of point | The name of major point should be expressed. | | Colour : Blue Arial Italic (1.5mm) *Point* | 9311 | | 1 | | |
| | Toponymy | Hydrology | Harbour/Bay name | 9 | 3 | 12 / 9312 | text | A name of harbour/bay | The name of major harbour/bay should be expressed. | | Colour : Blue Arial Italic (1.5mm) *Harbour/ Bay* | 9312 | | 1 | | |
| | Toponymy | Hydrology | Island, Peninsula name | 9 | 3 | 13 / 9313 | text | A name of Island and Peninsula | The name of island, peninsula should be expressed. | | Colour : Blue Arial Italic (1.5mm) *Island* | 9313 | | 1 | | |
| | Toponymy | Hydrology | Common hydrology name | 9 | 3 | 14 / 9314 | text | A name of common hydrology | The name of major common hydrology should be expressed. | | Colour : Blue Arial Italic (1.5mm) *Common hydrology* | 9314 | | 1 | | |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Toponymy | Associated Feature | Voltage of power line | 9 | 4 | 1 | 9401 | text | A value of voltage for a high tension line. | The voltage more than 33kv should be expressed. | The data will be acquired from the electric company or by the field verification. The voltage shall be expressed along the line. | Colour : Black Times New Roman (1.0mm) 132,000 V | 9401 | | 0 | | |
| | Toponymy | Associated Feature | Mine or Quarry name | 9 | 4 | 2 | 9402 | text | A name of mine or quarry. | The name of major mine or quarry should be expressed. | The data will be acquired by the field verification. | Colour : Black Times New Roman (1.5mm) Mine | 9402 | | 0 | | |
| | Toponymy | Associated Feature | Historical and Archaeological site name | 9 | 4 | 3 | 9403 | text | A name of historical or archaeological site. | The name of major historical or archaeological site should be expressed. | The data will be acquired by the field verification. | Colour : Black Times New Roman (1.5mm) Sigiriya | 9403 | | 0 | | |
| | Toponymy | Associated Feature | Common associated feature name | 9 | 4 | 4 | 9404 | text | A common name of associated feature. | The name of major common associated feature should be expressed. | The data will be acquired by the field verification. | Colour : Black Times New Roman (1.5mm) Sigiriya | 9404 | | 0 | | |
| | Toponymy | Land Classification | Park name | 9 | 5 | 1 | 9501 | text | A name of park. | The name of major park should be expressed. | The data will be acquired by the field verification. The name shall be plotted by the centre of feature. | Colour : Black Times New Roman (1.5mm) Park | 9501 | | 0 | | |
| | Toponymy | Land Classification | Farm name | 9 | 5 | 2 | 9502 | text | A name of aquatic, agricultural and livestock farm. | The name of major farm should be expressed. | The data will be acquired by the field verification. The name shall be expressed by the centre of feature. | Colour : Black Times New Roman (1.5mm) Farm | 9502 | | 0 | | |
| | Toponymy | Land Classification | Cemetery | 9 | 5 | 3 | 9503 | text | A name of cemetery. | The name of major cemetery should be expressed. | The data will be acquired by the field verification. The name shall be expressed by the centre of feature. | Colour : Black Times New Roman (1.5mm) Cemetery | 9503 | | 0 | | |
| | Toponymy | Land Classification | Land Classification common name | 9 | 5 | 4 | 9504 | text | A common name of land classification. | The name of major land classification should be expressed. | The data will be acquired by the field verification. | Colour : Black Times New Roman (1.5mm) Land Classification | 9504 | | 0 | | |
| | Toponymy | Vegetation | Vegetation common name | 9 | 6 | 1 | 9601 | text | A common name of vegetation. | The common name of major vegetation should be expressed. | The data will be acquired by the field verification. | Colour : Green Times New Roman (1.5mm) Common | 9601 | | 2 | | |

| No. | Feature Class | Data Class | Feature Name | F.C | D.C | No. | No. | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Micro station layer | | | | |
| | Toponymy | Topographic Feature | Contour height value | 9 | 7 | 1 | 9701 | text | A height value of each of contour. | The density of height value is 9 per 10cm by 10cm on a map including other elevation value for example spot height. | The direction of height value is perpendicular to contour line and toward a higher part. | Colour : Brown Arail Italic (2.0mm) 120 | 9701 | | 254 | | |
| | Toponymy | Topographic Feature | Bathymetric contour height value | 9 | 7 | 2 | 9702 | text | A height value of each of contour. | | The direction of height value is perpendicular to contour line and toward a higher part. | Colour : Blue Arail Italic (2.0mm) 120 | 9702 | | 254 | | |
| | Toponymy | Topographic Feature | Mountain, Mountain ranges, Ridge | 9 | 7 | 3 | 9703 | text | A name of mountain, mountain ranges, Ridge. | The famous mountain, mountain ranges, ridge should be expressed. | The data will be acquired by the field verification or the other document. | Colour : Brown Times New Roman Italic (1.5mm) *Mountain* | 9703 | | 254 | | |
| | Toponymy | Topographic Feature | Valley/Plateau /Canyons | 9 | 7 | 4 | 9704 | text | A name of valley/plateau/canyons. | The famous valley/plateau/canyons should be expressed. | The data will be acquired by the field verification or the other document. | Colour : Brown Times New Roman (1.5mm) Valley/Plateau | 9704 | | 254 | | |
| | Toponymy | Topographic Feature | Hill, Peak | 9 | 7 | 5 | 9705 | text | A name of hill, peak. | The famous hill, peak should be expressed. | The data will be acquired by the field verification or the other document. | Colour : Brown Times New Roman (1.5mm) Hill | 9705 | | 254 | | |
| | Toponymy | Administrative Name | Nation | 9 | 8 | 1 | 9801 | text | A name of country, considered especially in relation to its people and its social or economic structure. | All the name of nation should be expressed. | The data will be acquired by the official document. The centre of nation area shall be plotted. | Colour : Red Arial Regular (5.0mm) SRI LANKA | 9801 | | 3 | | |
| | Toponymy | Administrative Name | Province | 9 | 8 | 2 | 9802 | text | A name of province that is one of the large area into which some countries are divided, which usually has a government for that area. | All the name of province should be expressed. | The data will be acquired by the official document. The name shall be expressed along the boundary. | Colour : Red Arial Regular (2.5mm) NORTHERN PROVINCE | 9802 | | 3 | | |
| | Toponymy | Administrative Name | District | 9 | 8 | 3 | 9803 | text | A name of district that is a particular area of province, especially an area that is officially divided from others. | All the name of district should be expressed. | The data will be acquired by the official document. The name shall be expressed along the boundary. | Colour : Red Arial Regular (2.5mm) JAFFNA DISTRICT | 9803 | | 3 | | |

| No. | Feature Class | Data Class | Feature Name | Code Number F.C | D.C | No. | | Data Type | Definition | Acquisition criterion | Data Acquisition method | Symbol (Shape and Size) | Micro station layer Code | LV1 | Col | St | Lw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Toponymy | Administrative Name | Divisional Secretary's Division | 9 | 8 | 4 | 9804 | text | | All the name of divisional secretary's division should be expressed. | The data will be acquired by the official document. The centre of divisional secretary's division area shall be plotted. | Colour : Red<br>Arial narrow (3.0mm)<br>AYAGAMA | 9804 | | 3 | | |
| | Toponymy | Administrative Name | Grama Niladhari Division | 9 | 8 | 5 | 9805 | text | | All the name of grama niladhari division should be expressed. | The data will be acquired by the official document. The centre of grama niladhari division area shall be plotted. | Colour : Red<br>Arial narrow (2.5mm)<br>Rallyatta | 9805 | | 3 | | |
| | Toponymy | Administrative Name | Municipal/Urban Council | 9 | 8 | 6 | 9806 | text | | All the name of municipal/urban council or village should be expressed. | The data will be acquired by the official document. The centre of municipal/urban council area shall be plotted. | Colour : Purple<br>Arial narrow (2.5mm)<br>Halmessanbokka | 9806 | | 253 | | |
| | Toponymy | Administrative Name | Location, Place, Town | 9 | 8 | 7 | 9807 | text | | All the name of location, place, town and estate should be expressed. | The data will be acquired by the official document. The centre of location, place, town and estate area shall be plotted. | Colour : Black<br>Arial Regular (2.0mm)<br>Pallegama | 9807 | | 0 | | |
| | Toponymy | Administrative Name | Estate | 9 | 8 | 8 | 9808 | text | | All the name of estate should be expressed. | The data will be acquired by the official document. The centre of estate area shall be plotted. | Colour : Black<br>Arial Regular (2.0mm)<br>MAHYAYA | 9808 | | 0 | | |
| | Toponymy | Administrative Name | Administrative Common Name | 9 | 8 | 9 | 9809 | text | An administrative name except code number from 9101 to 9108 | All the name of administrative common should be expressed. | The data will be acquired by the official document. The centre of administrative common area shall be plotted. | Colour : Black<br>Arial Regular (1.8mm)<br>P | 9809 | | 0 | | |
| | Toponymy | Boundary | Forest Reservation, Sanctuary Wildlife, National Park name | 9 | 8 | 10 | 9810 | text | A name of forest reservation, sanctuary wildlife, national park | | | Colour : Black<br>Times New Roman (1.5mm)<br>National Park | 9810 | | 0 | | |

# Calibration Data of Aerial Camera

# DEUTSCHER KALIBRIERDIENST **DKD**

Kalibrierlaboratorium für geometrische Optik
*Calibration laboratory for measured quantities geometric optics*
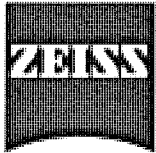
Akkreditiert durch die / *accredited by the*

## Akkreditierungsstelle des DKD bei der
## PHYSIKALISCH-TECHNISCHEN BUNDESANSTALT (PTB)

Deutscher
Akkreditierungs
Rat

DKD-K-05201

| 13255 |
|---|
| DKD-K- 05201 |
| 2007-12 |

## Kalibrierschein
## *Calibration Certificate*

Kalibrierzeichen
*Calibration label*

| | | |
|---|---|---|
| Gegenstand<br>*Object* | Aerial Survey Camera | |
| Hersteller<br>*Manufacturer* | Carl Zeiss<br>D-07745 Jena | |
| Typ<br>*Type* | LC 2015 | |
| Fabrikat/Serien-Nr.<br>*Serial number* | 272 304/C | |
| Auftraggeber<br>*Customer* | AERODATA Int. Surveys<br>Airport Business Center<br>Luchthavenlei 7<br>B-2100 Deurne , Belgium | |
| Auftragsnummer<br>*Order No.* | 41 635 | |
| Anzahl der Seiten des Kalibrierscheines<br>*Number of pages of the certificate* | 4 | |
| Datum der Kalibrierung<br>*Date of calibration* | 13.12.07 | |

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Der DKD ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
*This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The DKD is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates. The user is obliged to have the object recalibrated at appropriate intervals.*

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Akkreditierungsstelle des DKD als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift und Stempel haben keine Gültigkeit.
*This calibration certificate may not be reproduced other than in full except with the permission of both the Accreditation Body of the DKD and the issuing laboratory. Calibration certificates without signature and seal are not valid.*

| Stempel<br>*Seal* | Datum<br>*Date* | Stellv. Leiter des Kalibrierlaboratoriums<br>*Deputy Head of the calibration laboratory* | Bearbeiter<br>*Person in charge* |
|---|---|---|---|
| DKD-K-05201 | 14.12.07 | Weis | Müller |

Carl Zeiss
Industrielle Messtechnik GmbH
Mess- und Kalibrierzentrum
D - 73447 Oberkochen

Telefon    07364-20-3731
Telefax    07364-20-4511
E-Mail     kalibrieren@zeiss.de
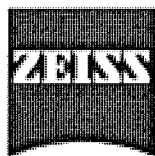
CAMERA TYPE:   LC 2015            SERIAL NO. 272304/C
LENS TYPE:     LAMEGON PL         SERIAL NO. 7390606D
MAX.APERTURE:  F/4                NOM. FOCAL LENGTH  150 MM

1) CALIBRATED FOCAL LENGTH = 152.138 MM

2) DISTORTION /0.001 MM, REFERRING TO P.P. OF SYMMETRY PPS

| S/MM= | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 0 | 1 | 0 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | -2 | -5 | -8 |
| 6 | 0 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 3 | 4 | 3 | 2 | 1 | -2 | -6 | -8 |
| 7 | 0 | 0 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 4 | 3 | 3 | 2 | 1 | -3 | -9 |
| 8 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 2 | -1 | -3 | -7 |
| AV. | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 3 | 2 | 1 | -1 | -4 | -8 |

3) P.P. OF AUTOCOLLIMATION AND FIDUCIAL CENTRE, REFERRING TO PPS

       P.P. OF AUTOCOLLIMATION PPA     X=  -0.009  Y=   0.011 MM
       FIDUCIAL CENTRE         FC      X=  -0.005  Y=  -0.001 MM
       CORNER FIDUCIAL CENTRE  FCC     X=  -0.008  Y=  -0.008 MM

4) FIDUCIAL MARKS, REFERRING TO PPS

       X1= 111.993   X2=-112.009   X3=  -0.005   X4=  -0.005 MM
       Y1=  -0.001   Y2=  -0.001   Y3= 111.994   Y4=-112.005 MM
       DISTANCES     1-2= 224.002              3-4= 223.999 MM
       X5= 109.994   X6=-110.003   X7=-110.010   X8= 109.988 MM
       Y5= 109.994   Y6=-110.004   Y7= 109.995   Y8=-110.005 MM

5) PHOTOGRAPHIC RESOLVING POWER, IN CYCLES PER MM
   (AS PER DEFINITION, R. P. IS NOT A CALIBRATED DATUM)
   AREA WEIGHTED AVERAGE RESOLUTION 88

   FIELD ANGLE /DEG =  0    7   14   21   28   35   42

   RADIAL LINES        104 116 113 109 115  95  77
   TANGENTIAL LINES    104 102 110 102  81  62  51

   FILM:  KODAK PANATOMIC X 3412      SPEED   40 AFS
   DEVELOPED IN AGFA G 74 C AVIPHOT

6) Filter

7) Magazines

8) Measuring uncertainty
   Distortion: U = 3 μm ; Point of symmetrie and collimation: U = 3 μm ; Image center: U = 5 μm ; Camera constant: U = 5 μm

   The specification indicates the upgraded measuring uncertainty resulting from the multiplication of the standard measuring uncertainty by the factor k = 2. It was determined in conformity with DKD-3. The values of the measurement parameter lie within the specified range with a probability of 95%.
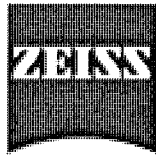
LC 2015           NO.272304/C
LAMEGON PL      4/150    NO.7390606D
CFL=152.138 MM

DISTORTION /0.001 MM, REFERRING TO PPS



S /MM
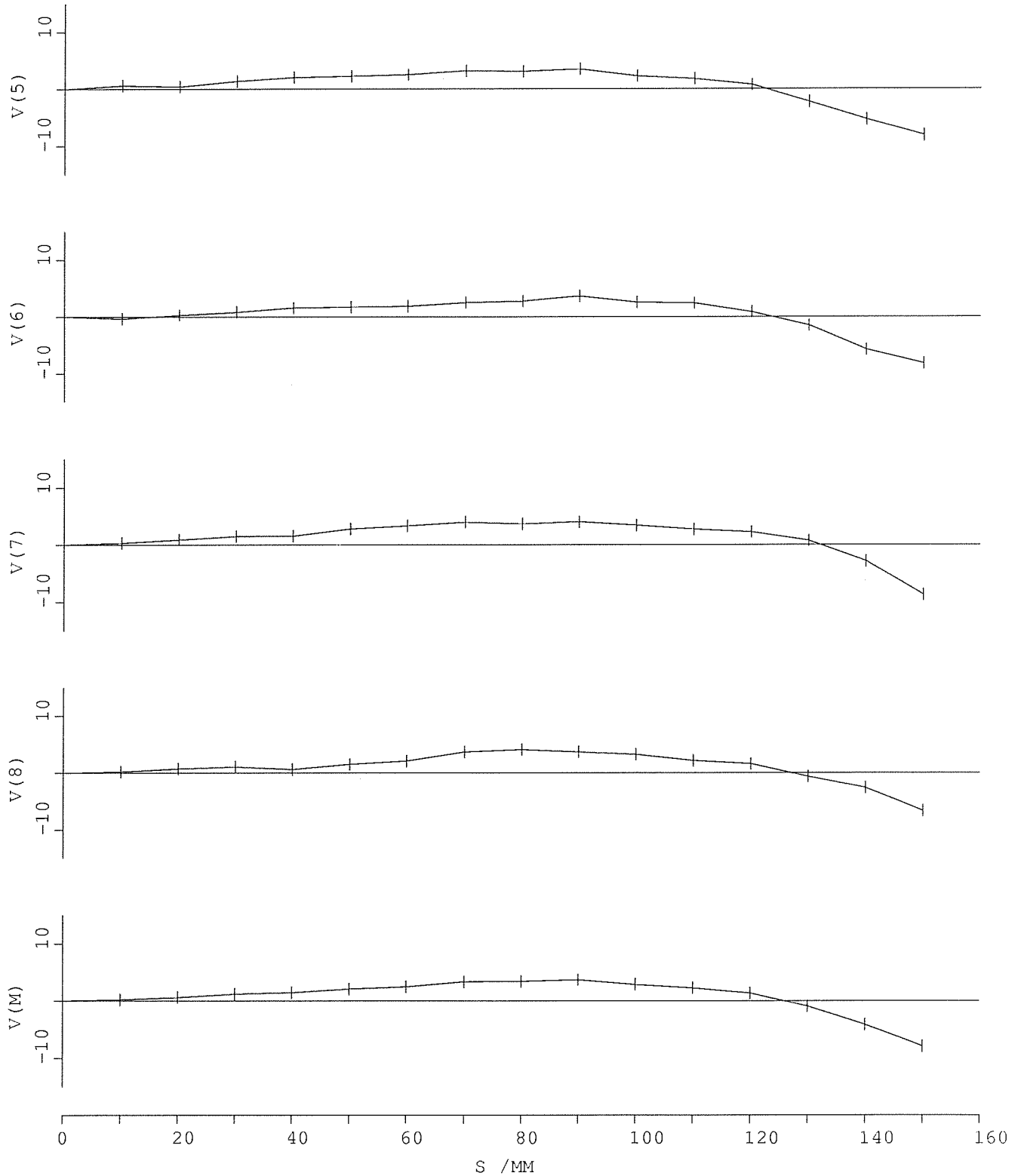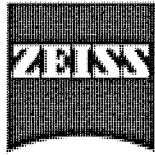
## LC 2015 NO.272304/C

### PHOTOGRAPHIC RESOLVING POWER

AWAR 88 CYCLES PER MM (230 MM X 230 MM NEGATIVE SIZE)

◇ RAD.

◎ TAN.

FIELD ANGLE /DEG
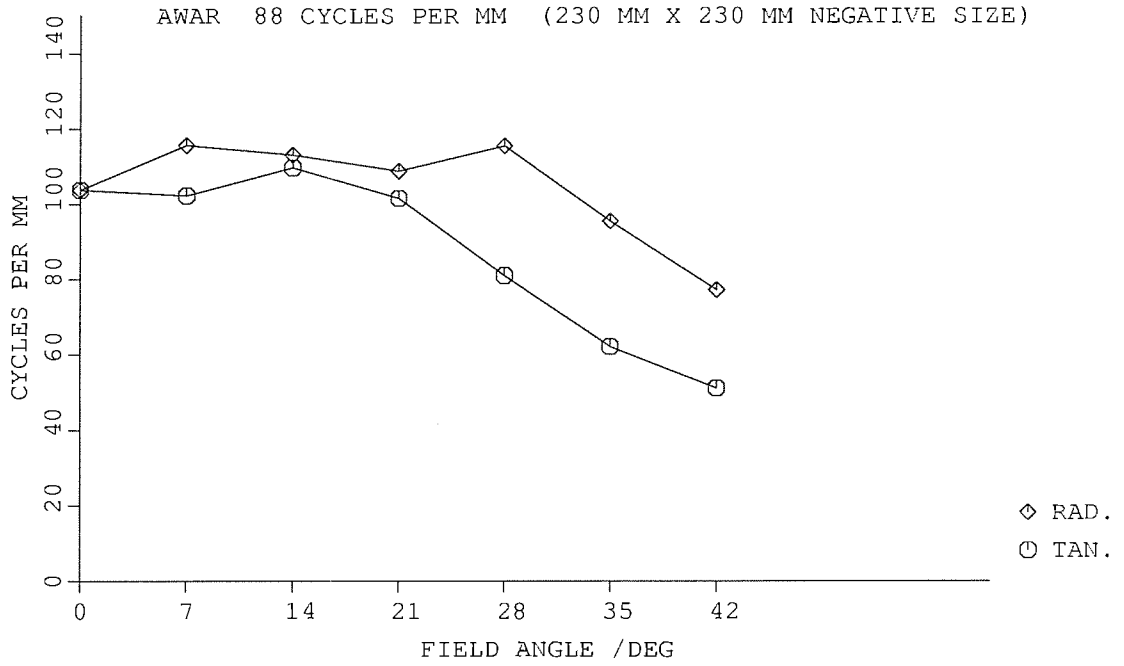
### DEPARTURE OF AVERAGE DISTORTION FROM ZERO REFERENCE

S /MM
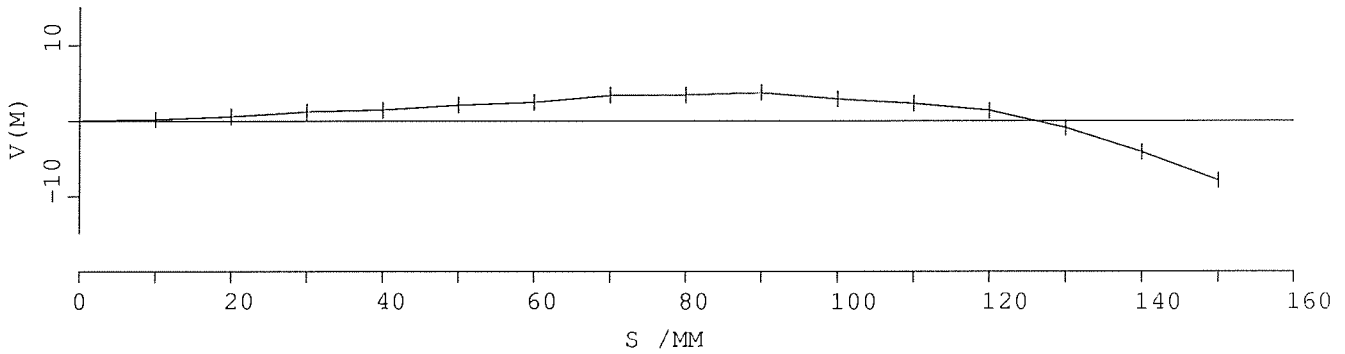
### PRINCIPAL POINT(PPA, PPS) AND FIDUCIAL CENTRE (FC)
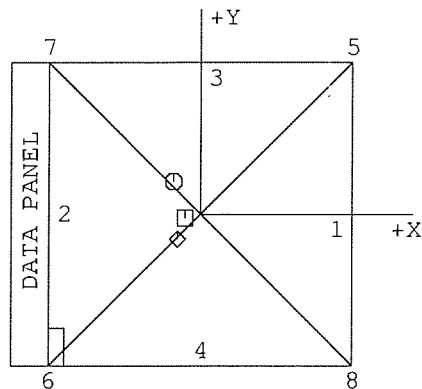
COORDINATES, REFERRING TO PPS

|  |  | X /MM | Y /MM |
|---|---|---|---|
| ◎ | PPA | -0.009 | 0.011 |
| ▱ | FC | -0.005 | -0.001 |
| ◇ | FCC | -0.008 | -0.008 |
|  | (CORNER FIDUCIAL CENTRE) | | |

⊢⊣ 0.01 MM, X-AXIS AS DEFINED BY FIDUCIAL MARK COORDINATES

$\alpha(6) = 0.0^0$     $\alpha(8) = \alpha(6) + 90^0$

This camera has been, tested in accordance with the existing regulations. The methods used are based on the Recommended Procedures for Calibrating Photogrammetric Cameras and for Related Optical Tests (International Society of Photogrammetry, 1960, reaffirmed 1964). The optical performance and the external construction are in accordance with our terms of delivery.

## 1.Calibrated Focal Length

The calibrated focal length is chosen so as to minimize the square sum of the radial measured distortion.

## 2. Distortion

The values of radial distortion refer to the calibrated focal length and to the principal point of symmetry (Section 3). Regarding the origin for distortion values it must be realized that in the photogrammetric process, the asymmetry due to a displacement of that point is eliminated together with the asymmetry introduced by camera tilt. The principal point of symmetry is chosen as origin for distortion, because only this residual asymmetry cannot be eliminated by simple compensation.

The radial distortion is measured for points of the focal plane separated by 10mm form the axis for each of the four radii 5, 6, 7 and 8. AV is the average radial measured distortion at a given radial distance. A positive value indicates that the image is further from the centre than its distortionfree  position. Measurements are made at maximum aperture on the goniometer by attaching the filter D (cut-off wavelength 535 nm at transmittance 50%). The measuring uncertainty (95%; k=2) 0.003 mm.

## 3. Principal Point and Fiducial Centre

The position of the principal point of autocollimation and of the fiducial centre (Section 4) are given in a rectangular coordinate system as indicated in the plot, with the principal point of symmetry as origin.

## 4. Fiducial Marks 2

For coordinate measurements the fiducial marks are recorded on photographic glass plates. Coordinates of the fiducial marks are given in a rectangular system as shown in the plot, with the principal point of symmetry as origin. Fiducial marks 1 and 2 lie in the line of flight. The location of the fiducial marks can be assumed to be accurate within 0.005 mm.

In the course of camera assembly and maintenance the fiducial marks are adjusted to meet the following specifications:

- The lines joining opposite pairs of fiducial marks intersect at an angle within 30 seconds of 90°.

- The point of intersection (fiducial centre) is within 0.02 mm of the principal point of autocollimation.

## 5. Photographic Resolving Power

The resolving power is obtained by photographing a series of three line high contrast test figures. The photographs are taken under the recommended standard illumination by using the filter B ( cut-off wavelength 490 nm at transmittance 50%). The camera is used at full aperture. The resulting image is examined with a low power stereoscopic microscope to find the spatial frequency of the finest pattern resolved. The values of resolving power are reduced to the image plane and refer to the focus settings as used for determining the calibrated focal length.

## 6. Filters

The two surfaces of the filters listed in the certificate are within 5 seconds of being parallel.

## 7. Magazine Platen

The platen mounted in the film magazine, serial no. as indicated in the certificate, does not depart from a true plane by more than 0.010 mm.

# Camera Calibration Certificate

**Object**

| Aerial Survey Camera Type | Lens Cone Type | Lens Serial-No | Remarks |
|---|---|---|---|
| RC 30 | 15/4 UAG-S | 13215 | |

**Acceptance**

| Characteristics | Acceptance | Remarks | |
|---|---|---|---|
| Radial distortion | yes | | |
| Photographic resolution | yes | | |
| Principal point of autocollimation (PPA) | yes | | |
| Principal point of symmetry (PPS) | yes | | |
| Fiducial marks | yes | | |
| Mean radial distortion | yes | | |
| Radial distortion for semi-diagonals referred to PPS | yes | | |

**Inspection**

| | | Signature / Remarks | |
|---|---|---|---|
| Date of calibration | 22.12.2010 | Lens cone operating hours | |
| Inspector Name | Paul Dietsche | | |
| Position | Supervisor | Signature: | |
| Inspection stamp-No | SO112 | | |
| Inspection plan Identification-No | 487872 | | |
| Version | 14.04.1989 | | |
| Lens cone calibration No | 870105 | | |
| process specification Version | 24.07.2006 | | |

**Maintenance**

| | | | |
|---|---|---|---|
| The last date, when service/ overhaul of this lens cone was performed. | 16.12.2010 | Lens cone operating hours 2297 | |
| Overhaul urgently required: | no | | |

This Camera Calibration Certificate contains five pages. It may not be reproduced other than in full.
Camera Calibration Certificates without signature and seal are not valid.

## Calibrated Focal Length (CFL)

| | |
|---|---|
| Aperture | 4.0 |
| Filter on goniometer | VIS (400 - 700 nm) |
| Filter on camera | -- |
| C.F.L. : | 152.90  mm |

## Radial distortion [micrometers]

Referred to principal point of symmetry (PPS)
Positive values denote image displacement away from center

| Radius [mm] | Half - Sides | | | | Mean |
|---|---|---|---|---|---|
| | 1 | 3 | 2 | 4 | |
| 10 | 0.8 | 0.1 | 0.6 | 0.5 | 0.5 |
| 20 | 1.3 | 0.1 | 1.2 | 1.2 | 0.9 |
| 30 | 1.4 | 0.4 | 1.5 | 0.6 | 0.9 |
| 40 | 1.7 | 0.9 | 1.4 | 1.2 | 1.3 |
| 50 | 1.8 | 0.6 | 1.7 | 1.7 | 1.4 |
| 60 | 1.5 | 0.9 | 2.3 | 1.8 | 1.6 |
| 70 | 2.1 | 0.8 | 2.2 | 2.4 | 1.8 |
| 80 | 1.9 | 1.3 | 2.6 | 2.6 | 2.1 |
| 90 | 3.0 | 1.1 | 2.9 | 2.5 | 2.3 |
| 100 | 2.7 | 1.0 | 3.5 | 1.9 | 2.2 |
| 110 | 2.0 | 0.9 | 3.4 | 2.7 | 2.2 |
| 120 | 0.7 | 0.8 | 1.5 | 1.9 | 1.2 |
| 130 | -2.9 | -0.8 | -1.1 | -0.3 | -1.2 |
| 140 | -4.6 | -4.0 | -3.5 | -2.7 | -3.7 |
| 148 | -8.1 | -6.8 | -8.3 | -8.4 | -7.9 |

## Photographic resolution [line pairs per millimeter]

Internal 3-line test-chart contrast log 2.0

| | |
|---|---|
| Apertur: | 4.0 |
| Filter: | VIS(400-700nm) |
| Film: | KODAK PANATOMIC X 2412 |
| Developer: | KODAK HC110 |

| Angle: [deg] | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|
| Radial: | 104 | 104 | 115 | 113 | 98 | 106 | 101 | 108 | 101 | 83 |
| Tangential: | 104 | 104 | 114 | 109 | 92 | 96 | 78 | 79 | 77 | 66 |

AWAR (Area Weighted Average Resolution) in lp/mm  95

## Principal point of autocollimation (PPA)
## Principal point of symmetry (PPS)
Referred to central cross (FC), see diagram

|     | x[mm] | y[mm] |
|-----|-------|-------|
| PPA | 0.000 | 0.002 |
| PPS | -0.009 | 0.004 |

## Fiducial marks
Referred to central cross  (FC)

|   | x[mm] | y[mm] |
|---|-------|-------|
| 1 | 106.003 | -106.003 |
| 2 | -106.004 | -106.001 |
| 3 | -106.006 | 106.005 |
| 4 | 106.006 | 106.003 |

|   | x[mm] | y[mm] |
|---|-------|-------|
| 5 | 0.000 | -110.002 |
| 6 | -110.001 | -0.001 |
| 7 | 0.000 | 110.005 |
| 8 | 110.004 | 0.004 |
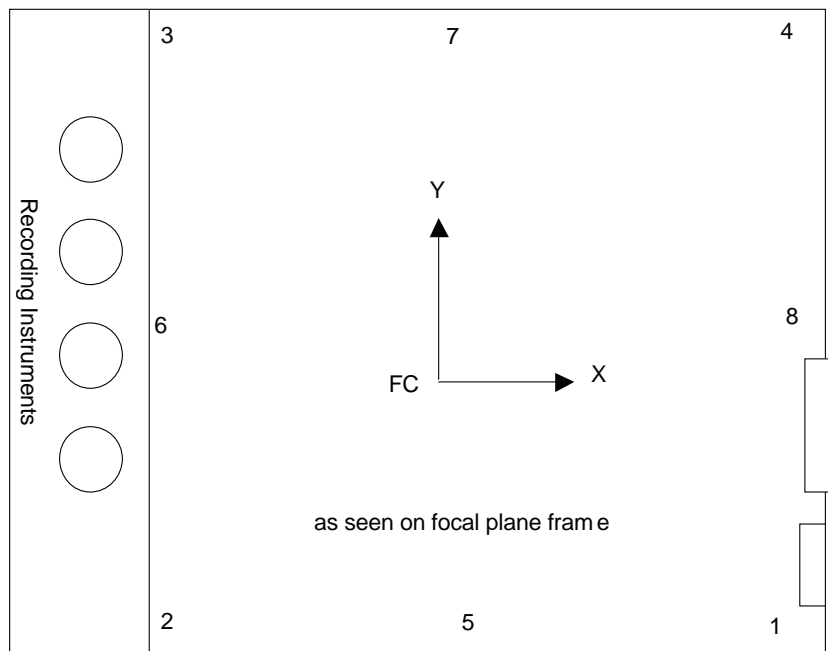


as seen on focal plane frame

| Aperture: | 4.0 |
|---|---|
| Filter on goniometer: | VIS (400 - 700 nm) |
| Filter on camera: | -- |
| C.F.L. : | 152.90  mm |



**Mean radial distortion**



**Radial distortion for semi-diagonals referred to PPS**

| Aperture: | 4.0 |
|---|---|
| Filter on goniometer: | VIS (400 - 700 nm) |
| Filter on camera: | -- |
| C.F.L. : | 152.90  mm |

**Mean radial distortion**

**Radial distortion for semi-diagonals referred to PPS**
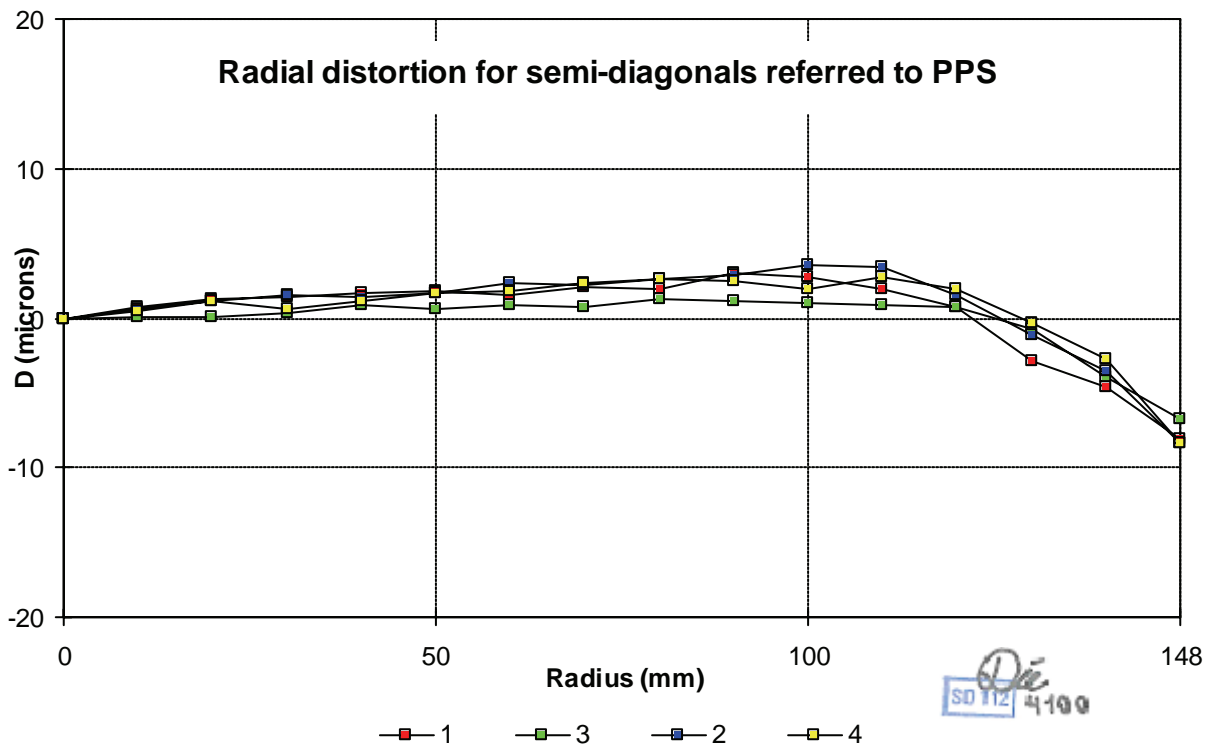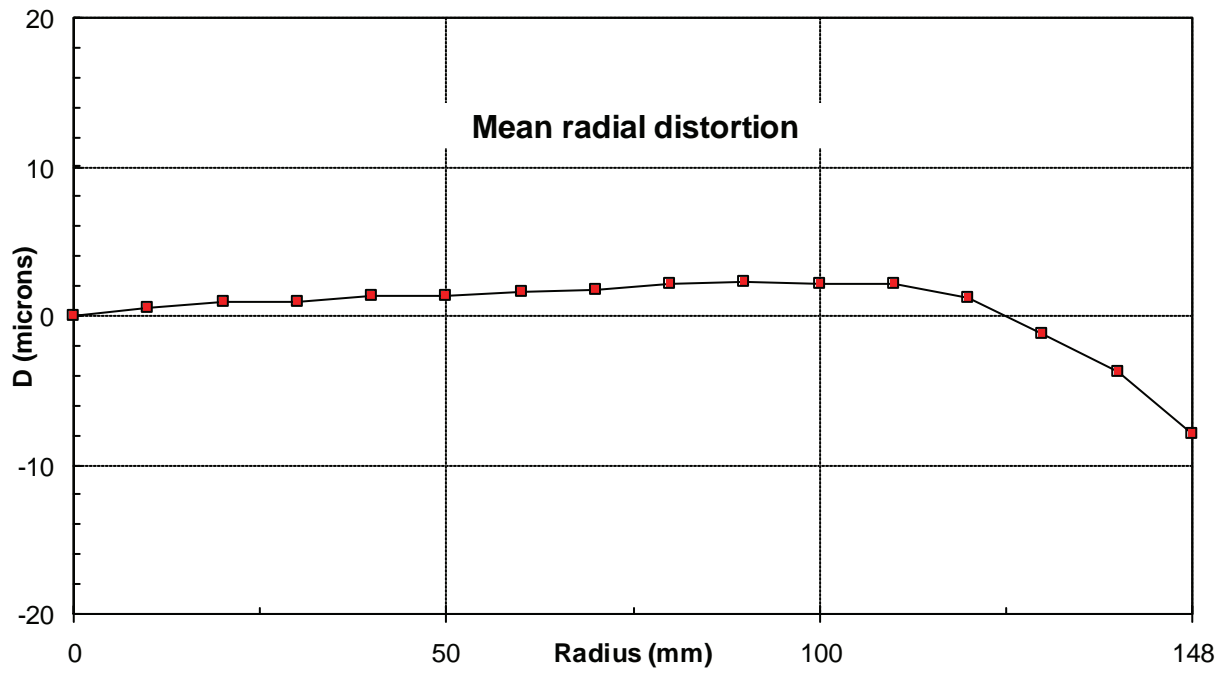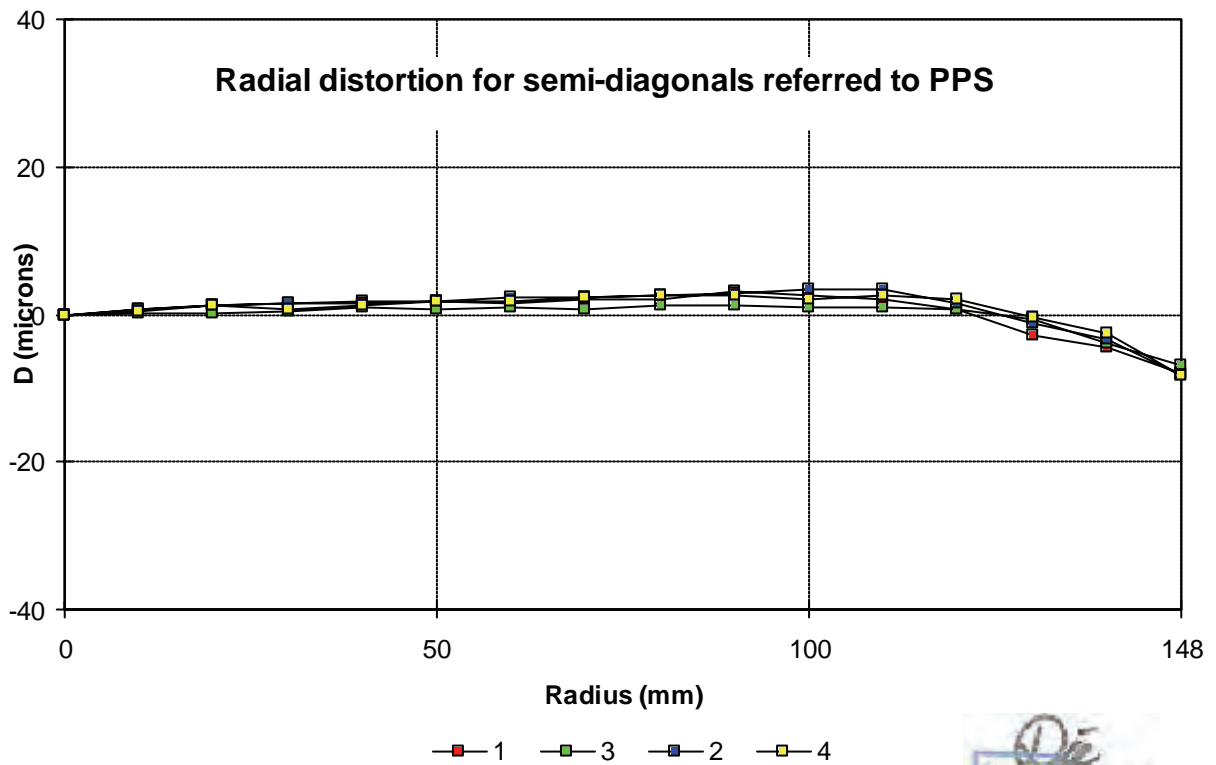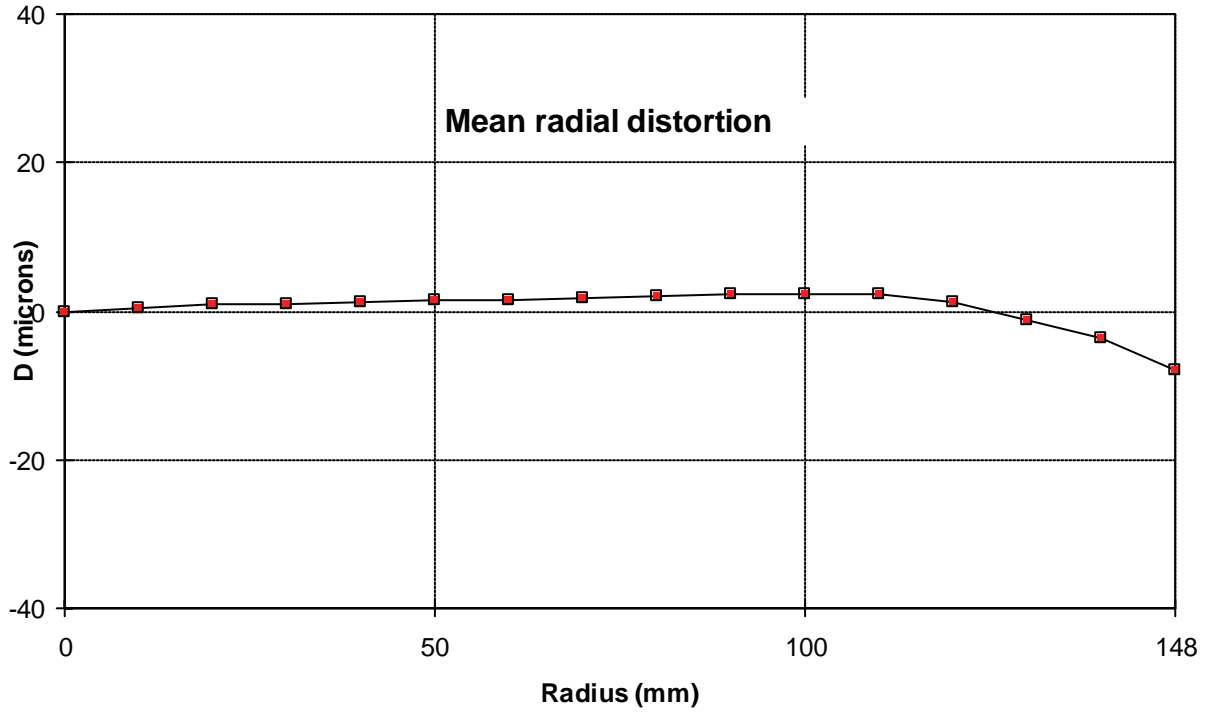
# Digital Topographic Mapping Project

# In Northern Region

PLOTTING SCHEDULE

ANNEX 04

Legend

To_be_plotted
Month_

A_December_2011
B01_January_2012
B02_February_2012
B03_March_2012
B04_April_2012
B05_May_2012
B06_June_2012
B07_July_2012
B08_August_2012
B09_September_2012
B10_October_2012
B11_November_2012
B12_December_2012
C01_January_2013

C02_February-2013
C03_March_2013
C04_April_2013
C05_May_2013
C06_June_2013
C07_July_2013
C08_August_2013
C09_September_2013
C11_November_2013
C12_December_2013
D01_January_2014
D02_February-2014
D03_March_2014
D04_April_2014
D05_May_2014
D06_June_2014
Forest_sheet
JICA

ANNEX 05

# PLOTTING SCHEDULE FOR DOUBLE WORK

Legend

To_be_plotted

MONTH_2012

- A_December_2011
- B01_January_2012
- B02_February_2012
- B03_March_2012
- B04_April_2012
- B05_May_2012
- B06_June_2012
- B07_July_2012
- B08_August_2012
- B09_September_2012
- B10_October_2012
- B11_November_2012
- B12_December_2012
- C01_January_2013
- C02_February-2013
- C03_March_2013
- Forest_sheet
- JICA

# Guideline (Work Manual)

**Democratic Socialist Republic of Sri Lanka**
**Survey Department of Sri Lanka (SDSL)**


# THE DGITAL TOPOGRAPHIC MAPPING PROJECT

## FOR

# RECONSTRUCTION OF NORTHERN REGION


### GUIDELINE (WORK MANUAL) ON

### METHODS FOR CREATION AND

### MAINTENANCE/MANAGEMENT OF THE VARIOUS DATA

### AND

### GIS DATABASE BUILDING AND SYSTEM DEVELOPMENT


**January 2012**


**JAPAN INTERNATIONAL COOPERATION AGENCY**

**KOKUSAI KOGYO CO., LTD**

**AERO ASAHI CORPORATION**

# CONTENTS

# Chapter 1 Basic Policy for Production and Maintenance / Management of the Various Data

The "various data" used throughout this Guideline (work manual) refers to geospatial data.

## 1.1 Basic Ideas for the Production of the Various Data

In the days when topographic maps in the analog format were being made, the basic idea was to create paper-based topographic maps of various scales for a target area. The final outputs of such creation were paper-based (analog format) topographic maps and their sources, original print plates and original trace drawings.

On the other hand, the basic ideas for production of digital-format geospatial data (various data) have been changed and diversified from the analog days.

(1) Basic ideas that have been changed

In the analog format, expressions such as topography, features, etc. in a topographic map for each scale are recognized as figures on a two-dimensional sheet of paper. The digital-format geospatial data, however, is based on the concept that geospatial information including topography and features should be recognized as digital data in various digital formats in a three-dimensional space. Furthermore, the concept of scales has been changed to the concept of levels of positional accuracy. In addition, the frequency of utilization and the usage fields of digital geospatial data have been drastically increased from those of analog topographic maps.

(2) Basic ideas that have been diversified

In the analog format, the topography and features to be expressed in each scale were the elements to be created. In the digital format, on the other hand, geospatial information is the target of creation, having diversified from the analog format in which only topography and features were the targets of creation. Furthermore, created information is visualized not only as two-dimensional images on a paper but also as two-dimensional and three-dimensional representation on displays, showing diversification. Additionally, the types of information to be visualized have diversified, covering a range of information of geometric properties to information of text properties.

Therefore, it is necessary to establish policy for creation, etc. of geospatial data according to the change and diversification of the basic ideas.

## 1.2 Policy for Production of the Various Data (Geospatial Data)

As described in the section on basic ideas, it is necessary to establish policy for production of geospatial data in thorough consideration of change and diversification.

### 1.2.1 Policy for Creation of Geospatial Data

(1) The creation of geospatial data shall be accompanied with the implementation of update and management at all times.

Once the production of geospatial data is planned, update and management of the data must also be implemented.   This is because, as soon as the production of digital-format geospatial data is completed, the digital data starts to become obsolete.   This is also because it is easy to alter and distribute the data by copying as it is in the digital format.

(2) The production of geospatial data shall be started with the topography and features of topographic maps as the target items.

In the initial stage of geospatial data production, the topography and features expressed in analog topographic maps shall be used as creation target items.   This is because, in the initial stage of creation, the purpose of using created data is likely to be an extension of usage of analog-format topographic maps.

(3) For topography and features of topographic maps as geospatial data, a layer structure and the data format of points, lines, and planes shall be introduced in consideration of use on a geographic information system (GIS).   The purpose of this introduction is to make geospatial data created from topography and features of topographic maps available for use at least on a GIS.

(4) The creation of geospatial data shall be promoted from the viewpoint of effective use of created data.

After creating data from topography and features of topographic maps, the creation shall be promoted from the viewpoint of effective use of created data, i.e., after identifying geospatial information required for effective use (such as created data items and formats, etc.).

(5) The specifications of created data shall be defined in case of the creation of geospatial data.

The specifications that clearly define the items, structures, formats, etc. of created data shall be defined in preparation for a wide range of use.

## 1.3   Policy for Maintenance/Management of the Various Data (Geospatial Data)

The various data, i.e., geospatial data is in the digital format.   As described in Section 1.1, the basic ideas have been changed and diversified from the days of analog-format topographic maps.   Therefore, the ideas of maintenance/management must also be drastically changed.   The policy for maintenance/management of geospatial data must be established from this viewpoint.

### 1.3.1   Policy for Maintenance/Management of Geospatial Data

The policy for maintenance and management shall be created in consideration of the facts that geospatial information is in the digital format and that the usage frequencies and fields will be increased in comparison with the analog format.

(1) The created geospatial data shall be segregated into data to be used for everyday work and data to be stored as backup, and maintained as such.

As described in the section "Basic ideas that have been changed," it is easy to copy or alter digital data (either intentionally or unintentionally).   Therefore, there is a possibility that created data can no longer be used (correctly read or displayed) regardless of whether the alteration was intentional or not.   As a means of precaution against such a case, a backup of created data must be stored in a

"safe place". Depending on circumstances, establishment more than one "safe place" shall be considered.

(2) The identity between working data for everyday operations and backup data shall be maintained.

Complete identity shall be maintained between working data for everyday operations and backup data. Particular attention shall be paid to both intentional and unintentional alterations of working data for everyday operations.

(3) Geospatial data shall be maintained and managed with a concept of strict scale.

When topography and features of geospatial data in the digital format is output in two dimensions, utmost attention shall be paid to the scale and positional accuracy of output maps because it is easy to scale the data.

(4) The produced data shall be managed in a time series.

The produced data shall be managed with time series information added to it. Using this information, the differences of production period (time) shall be clarified. Furthermore, data in which secular changes have been corrected shall be managed with time series information added to it.

This process shall be performed with an effective use of data with "history" in perspective.

(5) Unified management of the produced data shall be performed.

Multiple pieces of identical and non-identical data including working data for everyday operations and backup data shall be managed in a unified way.

# Chapter 2    Production of the Various Data

## 2.1    Establishment of Production Plan for the Various Data

A plan for production of the various data (geospatial data) shall be established and implemented as described in Section 1.2, "Policy for Creation of the Various Data."

### 2.1.1   Premises of Establishment of Production Plan

The following items shall be the premises of establishment of a plan for production of geospatial data:
* The technical capability and equipment required to produce geospatial data shall be available.

    Required equipment shall be introduced, and the technical capability required to produce geospatial data using the equipment shall be acquired by the counterpart through technical training and OJT.
* Necessities and usage purposes of geospatial data described in Section 2.2 have well-defined.

### 2.1.2 Establishment of Creation Plan

The plan for production of geospatial data to be established shall have the following characteristics:
* The production plan shall include an initial production plan and a management/update plan to be implemented after the initial plan.
* The production plan to be established shall be based on the production volume per unit time acquired in technical training and OJT.
* When the production plan is established, the human resources (number of engineers) and equipment (available number of devices) to be used for production shall be defined.

## 2.2    Necessity of Production of the Various Data

Due to technical trends of various data fields and requirements demanded of the various data by the society in general, topographic map information shall meet the following necessities:
* Evolution from analog-format information to digital-format information

    Topographical map information is required to evolve from the analog format to the digital format, the latter of which has a wider range of applications than the former.
* Evolution from topographic information consisting of graphic information of topographic features (two-dimensional) to three-dimensional geospatial information with attribute information

    There is a demand for geospatial data which is capable of description of forms and attribute information in three-dimensional space where human activities and events occur.

## 2.3    Usage Purposes of the Various Data

At present, the following two usage purposes are assumed for the various data (geospatial data).
* Digital topographic maps

* Geographic Information System (GIS)

### 2.3.1 Use as Digital Topographic Maps

Geospatial data, available for use as digital topographic maps, can be output to paper in the analog format or to a display in the digital format.

Since digital-format data can thus be output to paper, it can be used to make printed maps.

### 2.3.2 Use in Geographic Information System (GIS) Field

GIS with its large field of application makes the most of geospatial data as a database.   The use of geospatial data in the GIS field is far more wide-ranging than the use of it as digital topographic maps.

However, geospatial data in the GIS field can be used only if the requirements (specifications) for geospatial data in the GIS field are well-defined and satisfied.

## 2.4   Decision on Specifications of the Various Data

The specifications of the various data shall be prepared according to the usage purposes.

### 2.4.1 Specifications of Digital Topographic Maps

Specifications including the following items shall be prepared based on the specifications of analog topographic maps.

* Scale level
* Sheet division
* Definition, acquisition criteria, and acquisition method of topographic features to be acquired
* Code system of topographic features
* Data format (such as points, lines, planes, and etc.) for acquisition items
* Digital symbols (such as forms, colors, line types, line gauges, and etc.) of topographic features
* Digital marginal information data

### 2.4.2 Specifications of Geospatial Data in GIS

The specifications of geospatial data required in the GIS field are wide-ranging due to the diversity of GIS.   Basically, priority shall be given to the preparation of specifications of geospatial data required by GIS.   Then, geospatial data shall be produced based on the prepared specifications.

If the GIS that can be used is not clear at the time of production of geospatial data, the acquisition items, code systems, and data formats shall be specified in a general way.

### 2.4.3 Disclosure of Specifications of the Various Data

The prepared specification shall be disclosed to the public for the sake of use and dissemination of the various data.

## 2.5 Production Organization for the Various Data

When the specifications of the various data (geospatial data) become clear, the organization for creation of data must be formed.

Before a production organization is formed, it shall be discussed whether an existing organization is to be used or a new production organization is to be formed. The production organization shall include systems for accuracy control in each process and quality evaluation for final outputs.

### 2.5.1 Building of Production Organization

(1) Utilization of an existing organization

The various data (geospatial data) can be produced generally using the photogrammetry or map digitization techniques. For these techniques, there is an established process. Basically, an organization corresponding to this process exists in the production institute.

In general, therefore, an existing organization in the production institute shall be used to build a production organization.

(2) Other utilization

\* If there is no relevant organization or the organization is unclear

A new organization (for duty sharing) shall be made in a way that matches general processes in a photogrammetry or map digitization techniques (such as a temporary project implementation organization), and necessary relevant human and equipment resources shall be input.

\* If the technique for producing geospatial data is different

If the technique for producing geospatial data is different from a common technique (photogrammetry or map digitization technique), the processes of the technique shall be defined, and a new organization with each of the processes established as one unit shall be formed. Then, necessary relevant human and equipment resources shall be input to the organization of each process.

### 2.5.2 Building of Implementation Organization for Accuracy Control and Quality Evaluation

(1) Accuracy control

In order to perform accuracy control required for each of the processes, an organization and personnel independent from the workers in the relevant process shall be secured to form an implementation organization for accuracy control. Of course, the implementation guidelines for accuracy control shall be defined, and implementation results shall be recorded.

(2) Quality evaluation

Quality evaluation according to the ISO-based geographic information standards shall be performed on the geospatial data which is the final output. The guidelines for implementing quality evaluation shall be defined, and the evaluation results shall be recorded.

## 2.6   Production of the Various Data

When the specifications and production organization for geospatial data are defined, the production volume per unit in each production process shall be identified, a production plan shall be established from the available human and equipment resources, and production of data shall be performed.

### 2.6.1 Identification of Production Volume per Unit in Each Process

The production volume per unit in each process shall be identified according to the technique to be applied to produce data.   If there is a production volume per unit that has been identified from the past records, this value shall be adopted.   Otherwise, a pilot operation shall be performed to identify the production volume per unit.

### 2.6.2 Establishment of Production Plan

A production plan shall be established based on the quantity of geospatial data to be produced, the production volume per unit in each process that has been identified as described in the above, and the available human and equipment resources.

### 2.6.3 Production of the Various Data

Geospatial data shall be produced while maintaining the uniform quality of produced data according to the production plan.

(1) Production of data according to the specifications and operation manual

Production of data shall be performed while ensuring that the persons concerned have sufficient understanding of the content of the specifications and unifying the standards of operations (such as operation procedures) according to the operation manual.

(2) Production of data according to the creation plan

Production of data shall be promoted using the human and equipment resources that are input according to the production plan.   Furthermore, accuracy control specified for each process as well as quality evaluation of resultant geospatial data that is the final output shall be performed, and the results shall be recorded.

# Chapter 3　Maintenance/Management of the Various Data

## 3.1　Maintenance/Management Plan of the Various Data

The plan for maintenance/management of the various data (geospatial data) shall be established as described in Section 1.3, "Policy for Maintenance/Management of the Various Data."　Furthermore, a maintenance/management plan shall be established based on the premise that the various data has been created according to the creation plan.

### 3.1.1 Maintenance/Management Plan of the Various Data

Maintenance/management from the following viewpoints is required for digital-format data with different characteristics of analog-format data from policy for maintenance/management of the geospatial data. Since the digital-format data is expected to be used in a wider range of uses than that of analog-format data, maintenance/management from this viewpoint is also required.

　　　a. Maintenance/management for segregation of working data and backup data

　　　b. Maintenance/management for ensuring identity between working data and backup data

　　　c. Management of positional accuracy of data in consideration of characteristics of digital data

　　　d. Correction of secular changes (data update) and maintenance/management of time series data

　　　e. Unified management of digital data

　　　f. Supply and price policy for geospatial data

## 3.2　Segregation and Maintenance/Management of Working Data and Backup Data

For geospatial data, working data for everyday operations and backup data that serves as its source shall be segregated.

### 3.2.1　Segregation of Working Data and Backup Data

Geospatial data, being in a digital format, is always faced with a risk of alteration (even if it is protected) or deletion.　As a countermeasure against alteration and deletion, therefore, it is necessary to take a backup copy of data regularly and segregate it from working data.

### 3.2.2 Maintenance/Management of Working Data and Backup Data

Working data and backup date segregated as described in Section 3.2.1 shall be managed in a way not to confuse them.　For maintenance/management of backup data, it must be stored where there is no risk of alteration or deletion.

## 3.3　Ensuring of Identity between Working Data and Backup Data

Data to be used for everyday operations (working data) is always faced with a risk of alteration or deletion. Deletion can be dealt with by duplicating backup data.　On the other hand, partial alteration in everyday

use is not easy to discover, and the altered data is often used as an original data. To prevent such a situation, it is important to ensure the identity between working data and backup data.

To ensure the identity, it is necessary to monitor the update history of working data and create working data from backup data at regular intervals.

## 3.4 Management of Positional Accuracy in Consideration of Characteristics of Digital Data

Geospatial data includes topography and feature data with a specified positional accuracy as well as various attribute data. The various attribute data is basically free from the idea of positional accuracy or data scaling.

On the other hand, digital data of topography and features can be targets of scaling, and the display scale is recognized at all times. Therefore, there is a possibility of misunderstanding in the display position accuracy. In other words, there can be a misunderstanding that, when the display scale is enlarged, the positional accuracy is maintained at the enlarged scale.

To prevent such a misunderstanding, it is necessary to clearly declare the positional accuracy of topography and features.

## 3.5 Correction of Secular Changes (Data Update) and Maintenance/Management of Time Series Data

As soon as the production of geospatial data is completed, the data starts to become obsolete.

### 3.5.1 Necessity of Data Update

Compared with conventional topographic maps in the analog format, geospatial data has much higher usage frequencies and much wider usage fields. From these facts, it is required to update data (correction of secular changes) more than when analog topographic data is used.

### 3.5.2 Target of Data Update

Data update is targeted, of course, at all the data items (such as topography and features and attribute data). However, data items to be updated can also be specified in the actual phase of data update.

### 3.5.3 Method of Data Update

Geospatial data includes various information such as topography and features, and their attribute data. Unlike in the analog days, additionally, such data is not necessarily stored by each sheet. Therefore, it is necessary to consider targets of data update, such as update of all the data by each sheet and update of data by each item unit (including high-rank item units comprised of individual items). Furthermore, it is necessary to sufficiently examine how to update data based on the natures of the update targets to apply a rational update method.

The examples of data update methods are as follows:

(1) To update all the topography and features by each sheet:

Apply the photogrammetry method using image data.

(2) To update specific items in all the areas:

Collect and use update data (such as completion drawings of the specific items, and etc.) for the specific items.

(3) To update attribute data:

Retrieve and use update source data of the relevant attribute data.

## 3.5.4 Data Update Intervals and Updated Data

In the days of analog topographic maps, common practice was to correct secular changes by each neat line area at regular intervals (e.g., once every five years) in general.

The update of digital data such as geospatial data shall be examined in consideration of the facts that the usage frequencies and fields are significantly high and wide, respectively, as described earlier and that there is a wide range of data update targets and methods.

(1) Dismissal of monolithic update methods and intervals

Dismissal of the concept of fixed update method and intervals by each neat line area in the analog days shall be pursued. The update method and intervals in consideration of the characteristics of the digital format and the diversity of data content shall be adopted.

(2) Diversification of update method and intervals

Due to the characteristics of the digital format, it is possible to update each of the data items (topography and feature data, and attribute data). Therefore, data items for which update information (such as completion drawings for topography and features and update documents related to attribute data) can be obtained on a routine basis shall be updated as required without setting specific intervals.

On the other hand, data items for which update information cannot be obtained on a routine basis shall be updated in the procedure of updating all data items at regular intervals as usual (one, three, five years, etc.).

(3) Introduction of the concepts of "tentative updated data" and "final updated data"

As the update intervals diversify as described in the above, there will be different updated data at multiple timings. The following concepts shall be introduced to handle generated updated data.

a. Tentative updated data

It would be cumbersome if data updated on a routine basis is handled as the updated data. Therefore, data updated every week or month shall be maintained /managed as tentative updated data together with the update date and time.

b. Final updated data

Data in which all the data items are updated at regular intervals (reflecting also the routine updates) shall be maintained/managed as final updated data together with the update date and

time.

(4) Operations of tentative and final updated data

Tentative updated data and final updated data shall be managed as completely different data. When users request for use of geospatial data, either tentative or final updated data shall be provided according to the purpose of use.

## 3.6    Unified Management of the Various Data

Geospatial data that is easy to duplicate, such as working data for everyday operations, backup data, and tentative and final updated data, are generated in large numbers.

### 3.6.1 Time Series Management of Geospatial Data

All of the initially created data and subsequent tentative and final updated data always have timestamps at the time of generation.    Time series management of data shall be performed using these timestamps.    This operation enables a prompt supply of necessary data at a specific time.

### 3.6.2 Building of Archive of Geospatial Data

Whereas the previous section described the necessity of time series management of geospatial data, an archive of geospatial data shall be built.    This enables supply of geospatial data with discrete timestamps in the past.

### 3.6.3 Unified Management of Geospatial Data

Geospatial data is maintained and updated by several relevant departments, either independently by each of them or collaboratively by more than one of them.    Once maintenance or update is completed, however, produced or updated data shall be collected at a specific department to ensure a unified management by the department.    Then, any data required or data to be supplied shall be supplied from this department that performs a unified management.

As a part of the unified management of geospatial data, data shall be stored at two or more physically different locations to provide for loss of data in case of unexpected circumstances (such as natural or human disasters, and etc.).

## 3.7    Supply and Price Policy for the Various Data

The supply of geospatial data makes it necessary to define copyrights of data, content of supplied data, supply methods, and supply prices.

### 3.7.1 Copyrights of the Various Data

There are normally legal rights (in terms of the copyright law) attached to the created geospatial data. The legal rights (in terms of the copyright law) in Sri Lanka shall be defined, and the relation of rights between

the provider and users regarding the supply of the data shall be defined.

## 3.7.2 Supply of the Various Data

Geospatial data consists of various data items.  It is necessary both to identify the data that can be supplied by the provider and identify the data that can be supplied to a user, i.e., define the correspondence between data that can be supplied (data items and geographical areas) and users (such as government officials, private companies, and individuals).

Furthermore, it is necessary to define restrictions on the use of supplied data by users (such as restriction on copying, transfer to a third party, use for an unintended purpose, and restriction on making of derivative works).

Furthermore, it is necessary to examine how to supply geospatial data.  The following items shall be examined.

> \* Sites of supply:   Headquarters of Survey Department, branch offices of Survey Department, Website, etc.
>
> \* Means of supply: Media (such as CDs, DVDs and etc.), arbitrary media (such as USB memories, etc.), download from a Website
>
> \* Unit of supplied data:   By each sheet, by each item unit, and by a unit requested by a user

## 3.7.3 Price Policy of Supplied Data

Geospatial data is developed basically with an expenditure from the national finance.  In this sense, developed data can be considered as common properties of all the Sri Lankan people.

The idea of supplying the developed data with charge is seemingly contradictory to the above idea.  In consideration of benefits acquired by use of this data and permanent update of the developed data, however, it is not relatively irrational to ask the users for a certain degree of charge for update expenses.

From the above viewpoint, a price shall be set for supplied data, and users shall bear part of the update expenses.

The next issue will be how much this price should be. In this section, an idea for how to set a price is described.

Updated data shall be made at regular cycles as described earlier (making of tentative and final updated data).   Firstly, a total amount of expense to bear required for an update in one cycle and its period shall be estimated. Secondly, the total amount of data supplied to users in the above period shall be identified (inconsistencies in the number of data items and the units such as areas make it difficult to identify the total amount but it shall be done using indicators, etc.). Thirdly, the amount of expenditure for a unit indicator shall be calculated.   Then the administrative expenses for the supply of data shall be added to this amount to determine the supply price.

# Chapter 4    Basic Policy for System Design and GIS Database Construction

Targeted field of system design and database construction is the geographic information system (GIS).

## 4.1    Basic Ideas for System Design

When a system is to be designed in the GIS field, attention will have to be paid to the following (basic) ideas:

・Geographic location data included in all GIS systems shall be used effectively.

・In GIS, data is closely linked with individual functions (processes) and the data is used for performance of various different functions. Each data should have a structure that is not specifically designed for the performance of a particular function.

・For a function required for achievement of a purpose of a work process, a rational procedure for the achievement of the purpose shall be adopted without adhering to the actual procedure of the work process.

・GIS systems to be designed in future shall be designed with their scalability always taken into consideration as GIS is expected to continue to evolve further.

## 4.2    Basic Policy for System Design

Systems shall be designed in accordance with the basic ideas mentioned above and with the following basic policy:

＊Contents of the work in a field in which GIS is to be introduced (a target) shall be elucidated.

＊Data to be used for the achievement of the purposes of the work in the field in which GIS is to be introduced (a target) shall be identified.

＊When the contents of the work and the data used in the works have been elucidated, works in which GIS can be used shall be identified.

＊A priority order shall be established among the contents of the work in which GIS is to be used and GIS shall be introduced in the works in the order of priority with allowable budget and time taken into consideration.

＊The idea of developing a pilot system shall be introduced and verification of the system should be carried out. The results of the verification of the pilot system shall be reflected in the created system.

## 4.3    Basic Ideas for GIS Database Construction

The data produced in the various data production work shall be compiled into databases so that they can be used in GIS systems.    (In this procedure, the existing digital data shall be utilized effectively.)    At the same time, databases whose need has been recognized during the system designing shall be constructed as

GIS databases.

## 4.4    Basic Policy for GIS Database Construction

Databases shall be constructed in accordance with the basic ideas mentioned above and the basic policy mentioned below:

＊The existing digital topographic map data shall be compiled in a database for effective use.

＊GIS databases shall be constructed in accordance with the system design document.

＊GIS database shall be constructed in the order of the ease of compilation in accordance with the system design document.

＊A pilot GIS database shall be constructed and evaluated.

＊A plan for updating of GIS databases shall be formulated.

# Chapter 5    System Design

Targeted field of system design is GIS. The process of system design shall be implemented in accordance with the basic policy for the system design.

## 5.1    Implementation of a Study on Contents of Work in a Field in which GIS is to be Introduced (Target)

A study shall be conducted on contents of work in a field in which GIS is to be introduced.

### 5.1.1 Policy for the Implementation of the Study on Contents of Work

This study on contents of work shall not be implemented as a mere study. Instead, it shall be implemented on the assumption that GIS is to be introduced in the field. Therefore, it shall be implemented for the introduction of GIS.    From this point of view, the following study policy shall be adopted:

＊Works in the entire field (target) shall be studied.

＊All of the works actually being implemented shall be included in the study subjects.

＊Structures of organizations implementing the works shall be studied.

＊Works which are scheduled to be implemented in future in the field shall be included in the study subjects.

＊Implementing procedures of the work and data used in the procedures shall be included in the study subjects.

＊Relationship between the implementing procedures and data used in them shall be studied.

＊Implementing procedures of the future work and data to be used in them shall be studied.

### 5.1.2 Implementation of the Study on Contents of Work

Interviews and questionnaires shall be conducted for the study. After completing a study on the outline of the work as a whole, another study shall be carried out in order to elucidate implementation procedures of each work, to identify data used in the procedures and to elucidate how the data is used. The study shall include not only oral explanation in the interviews and written responses from the questionnaires, but also inspection of works actually being implemented.

The study shall also elucidate how often each work is implemented, how new data to be used in the work is acquired and how the existing data is updated.

## 5.2    Analysis of the Result of the Study on Contents of Work

Results of the study shall be analyzed in a way appropriate for the assumption of the introduction of GIS in the field.

## 5.2.1 Arrangement of the Study Results

The study on contents of work shall elucidate purposes, procedures and data used in each work composing the entire work. Meanwhile, the arrangement elucidates the structure of the work composed of each work as its element, from the viewpoint of the entire work. In the process of elucidating the structure, relationships between contents of work, significance of the results of the works and repeated use of the same data shall also be elucidated.

Works which are being planned shall also be included in the structure of the work in the same manner as the existing works actually being implemented are included. Methods to produce and update data which is likely to be forgotten and frequencies of such process shall be linked with the above-mentioned structure.

## 5.2.2 Conceptual Functional Model for the Existing Works

The structure of work revealed by the arrangement of the study results and the structure of work shall be presented in an exploded view drawing as a conceptual functional model for the existing work so that contents of work, relation between them and data used in them can be easily understood.

## 5.3   Designing of GIS Conceptual Functional Model

The arrangement of the study results and preparation of the conceptual functional model for the existing works have revealed the works being implemented or planned before the introduction of GIS, *i.e.*, systematization.

## 5.3.1 A Study on Contents of Work and Elucidation of Demand in the Procedure of Introducing GIS

The current state of the work revealed in the conceptual functional model for the existing works shall be evaluated from the viewpoint of the introduction of GIS to elucidate problems in the works and how GIS should be used to solve the problems.

Demand for additional results of the works expected from the introduction of GIS shall also be elucidated.

## 5.3.2 Designing of GIS Conceptual Functional Model

A GIS conceptual functional model which enables problem solution with the introduction of GIS and which satisfies additional demand expected from the introduction of GIS shall be designed.

In actual designing of a GIS conceptual functional model, correspondence between each work and function of GIS shall be ensured and relations between each function and data shall be established.   After completing this process, a GIS conceptual functional model including all of the works or functions, shall be presented in an exploded view drawing.

### 5.3.3 Contents of Work (Work Functions) and Data

A created GIS conceptual functional model can be used to take a general view of the entire work.　In order to facilitate designing of GIS (system design), the contents of work (work functions) and data used in them shall be compiled in a relational matrix using this model and the results of the study on the contents of work which have been arranged.

## 5.4　Logical Design of GIS

Designing of a GIS conceptual functional model has elucidated the conceptual functions of the works and available data. In the logical design of GIS, data flow, actual processing of data with each function, nature of data and format for presenting the outputs of the work shall be designed practically in preparation for the actual installation on computers.

The focus of the effort shall be on a design centered on secure, consistent and stable data (against the passing of time and a changing environment for system use).

### 5.4.1 Identification of the Outputs of the Works and Designing of Output Presentation

The exploded view drawing of the GIS conceptual functional model has revealed the outline of the outputs of each work.

（1）Deserting of uniform method and interval of data update

For each work result identified in the exploded view drawing, various data revealed in the result shall be elucidated. In practice, data items and units for presentation shall be identified.

（2）Designing of output presentation

A study shall be carried out and data shall be collected on how the outputs of each work have been presented in the analog era. Another study shall be carried out on how outputs of new activities shall be presented.

Collected data and results of the studies shall be used to define formats of the presentation including data items to be presented, units for presentation and layouts.

### 5.4.2 Designing of GIS Logical Model

A general view of entire work can be presented on the exploded view drawing of a GIS conceptual functional model.　This exploded view drawing shall be used in designing of the GIS logical information flow and GIS logical data model, which are the components of a GIS logical model.

(1) Designing of GIS logical information flow

The outputs to be obtained from implementation of the work have been elucidated in 5.4.1.　In the design of GIS logical information flow, the following items shall be defined to show how the

data is used to obtain the outputs of the works.

＊Data required for obtaining the work outputs shall be identified.

＊A data processing method required for acquiring work outputs shall be elucidated.

＊A processing method to display the processed results in the display format designed in 5.4.1.2) shall be identified.

The procedure mentioned above shall be applied to each work output and, when the same data is required for processing of different outputs, arrangement shall be made in order to prevent production of redundant data. In such a case, arrangement shall be made on the processing methods with focus on highly secure and stable data.

GIS has as much processing methods to apply as possible in its library. Combination of these functions and the existing functions shall be used as processing methods.

(2) Designing of GIS logical data model

Identification of the data required for obtaining work outputs and of the work outputs as well as designing of output presentation has been completed by the preceding paragraph. On the basis of these results, actual data handled in each stage shall be identified individually and a logical data model elucidating how the data will change, what relationships will be created between them and what types of data will be produced in the data processing, shall be produced.

(3) Definition of the logical data

Data handled in a logical data model shall be the logical data in the model.

Existence of ambiguity in the contents of the data described in the model, or logical data, is inconvenient for the system. Therefore, each element of the logical data shall be defined precisely.

The definition shall include the concrete meaning of logical data; data style and format, accompanied attribute data and its data format.

(4) Limitation on the logical data

The logical data defined in the preceding paragraph may have limitation on values which can be taken depending on their nature. In addition, data style and format used for each logical data are uniform. Furthermore, many accompanied attribute data have values within certain ranges. In this manner, the ranges which logical data can take shall be defined as limitation of the logical data and they shall also be used as a tool to maintain the quality of logical data during its production (*i.e.* construction of databases).

# Chapter 6    Construction of GIS Databases

GIS database is to be constructed in accordance with the GIS system design document.

## 6.1    Compositions of GIS Database

GIS databases shall naturally be constructed in accordance with the system design document. Consequently, the system design document also specifies the composition of GIS databases.

The general composition of a GIS database stipulated in the system design document is as follows:

＊A database used by GIS (mainly graphic data)

＊Attribute data of the database used by GIS (mainly text data)

＊Attribute data of the database used by GIS (mainly graphic and imagery data).

＊A topographic map database of the geographic area covered by GIS

## 6.2    Construction of GIS Topographic Map Databases

A "GIS topographic map database" corresponds to a "topographic map database of the geographic area covered by GIS" mentioned above.

### 6.2.1 Utilization of the Existing Topographic Map Data

Various geospatial data to be produced, maintained and managed are a type of the existing topographic map data. Since they are in a digital format, they could be used in the construction of GIS topographic map databases.

  (1) Structuring of the existing topographic map data

        The existing topographic map data (various data: geospatial data) are digital data of various topographic features represented on topographic maps acquired in accordance with the map symbol specifications. They can be used as GIS topographic map database after structuring of these data.

    1)  Structuring

       In the structuring, a layered structure of various topographic feature data shall be introduced (each topographic feature shall be provided with a code) based on the map symbol specification and the same topographic features in a map shall be considered as data in the same layer (they shall be given the same feature code).

       Data type (point, line, surface, and etc.) shall be defined for each layer (with each feature code).

       By converting to the format specified in the GIS system design document, the existing topographic map data shall be used as GIS topographic map data.

## 6.2.2 Construction of GIS Topographic Map Databases

While construction of GIS topographic map databases using the existing topographic map data has been described in 6.1.2, there are cases in which a new database is to be constructed. Such a database shall be constructed with the following taken into consideration:

＊A GIS topographic map database shall be constructed with the topographic feature items required by the GIS system design document.

＊A GIS topographic map database shall be structuralized (with specific layered structure, data types and data formats).

＊A GIS topographic map database shall satisfy the positional accuracy required by the GIS system design documents.

## 6.3　Construction of Databases used by GIS

Logical data based on the GIS logical model (a database used by GIS) designed in the previous chapter shall be constructed.

On the basis of the characteristics of GIS, graphic data with positional data, attribute data in the text format and in graphic/imagery formats accessory to the graphic data, are assumed to be the logical data.

Since the specifications of these data have already been defined in detail in "Designing of GIS logical Data Model," a database shall be constructed in accordance with the specifications.

However, actual database construction shall be implemented with the following issues taken into consideration:

＊If original data is in digital formats, data shall be thoroughly examined to confirm whether they comply with the specifications established on the basis of "Designing of GIS Logical Model." Additional processing of data, Such as conversion to a different format, shall be carried out, if necessary.

＊If original data is in analog formats, the data shall be digitized with the use of a digitization method which satisfies positional accuracy required by the specifications. Sufficient attention shall be paid to avoid omission or duplication of data while attribute data is being digitized.

# Chapter 7  Verification of GIS System

GIS shall be constructed in accordance with the GIS system design document.

## 7.1  Construction of GIS

GIS consists of system and databases constructed in accordance with the system design document.

### 7.1.1 Construction of GIS System

A GIS System shall be constructed in accordance with the system design document.  Data processing functions required for the GIS system are often found in the libraries of GIS engines which make GIS system operational.

It would be a wise procedure to achieve the original purpose of GIS by utilizing these libraries effectively.

### 7.1.2 Construction of GIS Databases

Issues to be taken into consideration in the construction of various types of databases to be used by GIS have been described in Chapter 6. Various types of databases shall be constructed with these issues taken into consideration.

## 7.2  Verification of GIS

The constructed GIS shall always have to be examined whether it functions as described in the design document before its operation for actual services.

### 7.2.1 Verification of GIS system

All the functions mentioned in the GIS system design document shall be started up and thoroughly examined whether correct results can be obtained.

For the verification of the GIS system, it shall be operated with a correct database and then evaluated for whether the system has provided accurate results or not.

### 7.2.2 Verification of GIS databases

Examination shall be conducted to verify whether the constructed GIS databases are in conformity with the prescribed specifications and can be installed on the GIS system properly.

In addition, the GIS systems shall be started up and verified whether the functions utilizing these GIS databases work appropriately and provide correct results.

## 7.3  Efforts for Revision and Expansion of GIS

### 7.3.1 Revision of GIS system

If the GIS system has been found to have defects on the based of the results of the examination/verification of GIS described in 7.2, revision of the GIS system, including revision of the system design document, shall be implemented.

### 7.3.2 Revision of GIS databases

If a GIS database has been found to have defects on the basis of the result of the examination/verification described in 7.2, revision of the GIS database, including revision of the system design document (the specifications for GIS databases), shall be carried out.

### 7.3.3 Verification of GIS

As mentioned above, required revision shall be made on the basis of the results of the examination/verification of GIS. The system shall be verified again after the revision in order to confirm that all the functions operate appropriately.

# Results of Questionnaire Survey

# \<Results of the questionnaire survey on use of the maps>

Questionnaires were distributed to the participants of the Project Seminar/Workshop held on 4th November in order to collect their views on future use and application of the project outputs which was raised as an issue requiring a new investigation.

Before the preparation of the questionnaire, the Study Team explained JICA's interest in use and application of the output topographic maps to SDSL and SDSL acknowledged the importance of the survey.   The Study Team prepared a draft questionnaire, held discussion on it with SDSL and finalized the contents of the questionnaire, incorporating suggestions made by SDSL.

## 1. Distribution and Results of collection of the questionnaires

It was decided that the questionnaires were to be handed to participants of the Seminar/Workshop at its venue and were to be collected from them when they were leaving the venue.

Approximately 150 people, including invited guests and the members of the Study Team, attended the Seminar/Workshop.   Filled-in questionnaires were collected from 23 participants (including 10 SDSL staff members).

## 2. Questions in the questionnaire

The questionnaire was prepared with the intention to obtain not only views on use and application of the produced topographic maps, but also requests to SDSL as a mapping organization which is responsible for maintenance and management of the maps. It also sought to receive instructive comments on this project from the participants.   The questionnaire contained the following seven questions:

Q1:   Will you use the 1/10,000-scale topographic maps of the northern region produced in this project in your future work?   If you will, how will you use them?

Q2:   If your answer to Q1 is 'no,' why will you not use them?

Q3:   Do you have any advice on provision of digital topographic maps by SDSL?

Q4:   Do you have any special request to SDSL on the topographic maps produced in this project?

Q5    Are there any areas which should be given priority for mapping?

Q6:   Do you have any comment on this project of producing topographic maps of the northern region?

Q7:   Are you interested in using colour-ortho images and/or ortho-photo maps in your work at this moment?   (Please write down the name of your organization)

# 3.    Responses to the questionnaire

Although respondents were not requested to identify themselves, most of them identified themselves.

## 3.1  Summary of the responses to each question

Q1)    With the exception of one respondent who did not answer this question, all the respondents answered affirmatively to the question on the use of the maps. Participants from government offices other than SDSL commented that they could use the maps in studies on project planning and decision-making process in their areas of responsibilities.

Q2)    No respondents replied "no" to Q2.

Q3)    while some of the respondents commented on both free and paid provision of data, most of them requested proactive data provision.   Some recommended establishment of an on-line purchase system through the Internet and distribution of data in CDs at the branch offices of SDSL.   Others recommended more frequent production and update of administrative boundary data and promotion of expansion of JICA's assistance to other regions.   However, there were negative comments on the high cost of the mapping.

Q4)    Approximately half of the respondents provided their responses to this question. Some requested production of digital topographic maps of the unmapped area in the northern region as soon as possible.   Others requested production of new larger-scale 1/5,000 digital topographic maps of urban areas and inclusion of additional data on forest and wild life protection areas on the maps for environmental protection.   A respondent from the private sector made a comment requesting data provision for promotion of business activities in the northern region, similar to one of the responses to Q3) mentioned above.

Q5)    Approximately half of the respondents provided their responses to this question. Many of the respondents hoped for topographic maps covering major cities in the northern region (*e.g.* Kilinochchi and Vavunya) to be produced as soon as possible and for the similar projects to be implemented in other regions.

Q6)    Most of the respondents regarded highly the outputs of this project of producing topographic maps.   Some commented on necessities for expansion of the project to the unmapped areas in the northern region in the near future and establishment of a mechanism to update maps.

Q7)    Approximately 1/3 of the respondents provided their responses to this question.   Some of them made comments suggesting possible use of the map produced in this project in

the National Land Title Program (a.k.a. "Bim Saviya" locally).

## 3.2 Overall evaluation

Most of the responses were very favorable to the project. Apart from the responses to the questionnaires, some participants highly regarded the commencement of the provision of the digital topographic maps at an opportune moment when the country at the stages of reconstruction to development required them in the seminar/workshop. Some participants from the implementing agency, SDSL, requested proactive provision of the topographic maps. It must have confirmed the readiness of SDSL staff members to take initiative in the project, which can be considered as one of the outcomes of the seminar/workshop.

Meanwhile, since only a part of the northern region had been mapped in this project, there is expectation for mapping of the unmapped areas, which is to be implemented by SDSL. Thus, there is expected to be an opportunity where implementation of follow-up technical assistance would be effective.

# 4. Lessons learned

This questionnaire survey, which was not in the original plan, was proposed by the Study Team and implemented at short notice. Therefore, preparation for the survey was undeniably insufficient. Partly because of a lack of communication, the questionnaires were distributed before the beginning of the latter half of the seminar/workshop program in the afternoon, by which time some of the participants, including the invited guests, had already left the seminar/workshop venue. This is considered as the reason for the small number of questionnaires collected. From these facts, the Study Team recommends that a similar questionnaire survey shall be prepared with full knowledge of its purposes and significance shared among organizers in order to obtain informative responses.

| No. | Organization | Name | Q1<br>Will you use the 1/10,000-scale topographic maps produced in this project in your future work? If you will, how will you use them? | Q2<br>If your answer to Q1 is 'no,' why will you not use them? | Q3<br>Do you have any advice on provision of digital topographic maps by SDSL? | Q4<br>Do you have any special request to SDSL on the topographic maps of the northern region? | Q5<br>Are there any areas which should be given priority for the mapping? | Q6<br>Do you have any comment on this project of producing topographic maps of the northern region? | Q7<br>Are you interested in using colour-ortho images and/or ortho-photo maps in your activities at this moment? (Please write down the name of your organization) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SLAF（Sri Lanka Air Force) | Cheshan Rajapakshe | I will use them. | - | The latest maps will be very important for development planning. Spread of use of the digital data will make public land resources in our country in accordance with various agreements. | Digital mapping is required for areas close to the mapped area where people concerned have a need for the mapping . | No comment in particular. | I believe that the latest technologies have been transferred to SDSL. | We would like to obtain the photographs for military use. |
| 2 | SDSL (Survey Department of Sri Lanka) | Illegible | ? | No comment in particular. | No comment in particular. | No comment in particular. | No comment in particular. | No comment in particular. | No comment in particular. |
| 3 | SDSL? | S. Bavan | I would like to use them for optimal analysis and research on Emergency Stations in Jaffna Area. | - | The maps produced in this project help confirm names of important places (schools, hospitals, post offices and historical sites) during field surveys and database construction. | Results of revision surveying conducted by SDSL branch offices should be incorporated in the digital topographic map data. Incorporation of such data will improve usefulness of the maps. I would like 1/10,000-scale maps revised in accordance with results of a revision surveying to be circulated whenever surveying is carried out. | I would like names of road intersections to be represented on maps. | It is recommended that the methods used in the field identification conducted by the JICA Study Team are used in the regular map revision of SDSL. | I would like to have colour photo prints for surveys and problem analyses carried out at branch offices. |
| 4 | UNOCHA | Asela Bandara | We have been using 1/50,000-scale maps of the northern region. From now on, we will be able to use 1/10,000-scale maps! | - | I request production of administrative boundary data. | Same as on the left | I request digital mapping of Kilinochchi and Mullaittivu Areas. | No comment in particular. | UNOCHA |
| 5 | A governmental organisation | Illegible | The maps with accurate contour lines and geographic data are useful in designing all construction plans. | No comment in particular. | No comment in particular. | Update of all maps of the northern region and production of the 1/10,000-scale topographic maps will contribute to development planning of the region. | Vavunya Town and secondary towns. | Update of geological maps of the northern region for development of surface water and groundwater resources. | Colour ortho photos will be useful for groundwater survey. |
| 6 | ICRC(International Committee of the Red Cross) | Illegible | I will use them because I will be able to obtain more detailed information from these maps. However, the cost is high. | - | Update of administrative boundaries, provision of data in the pdf format to the general public. | No comment in particular. | - | Illegible | Colour ortho maps will be useful (*e.g.* in rehabilitation of irrigation channels). |
| 7 | SDSL | N. Tharmapala | I will use them because they are useful for measuring distances and areas of specific areas in feasibility studies implemented for all types of projects. | No comment in particular. | Use of these maps should benefit people at the bottom of society for economic growth and should not be limited to administrative use. | The data should be made available to all private enterprises immediately. | - | This project was a good project. It would be better if the poor could benefit from this project. | |
| 8 | Department of Land Administration | Illegible | I will use them in the process of decision-making in the land administration. Since the northern region is dependent on groundwater and water in ponds as sole water resources, these maps will help us greatly in decision-making in future | - | Data on land is very important. It will be important to distribute the maps produced in this project to each region because they are useful to all stakeholders, including those involved in agriculture, irrigation, environment, road, water supply and shoreline protection. | I request representation of protection areas and incorporation of all layers (especially, those of data on forests, wild bird sanctuaries, etc.) on the output maps. | Narathankerney - Kndathari, Nagarkovil, Coastal belt (Jaffna - Nallen) and along the Route A9. | If the map data is produced in near future, such data will contribute to implementation of Bim Saviya (National Land Title Program) and irrigation and agricultural development projects. | They will be very useful for decision-making in Bim Sayiya and the process to solve land disputes. |
| 9 | District Secretariat, Kilinochchi | N. Gowrithasan | Since all the documents were lost during the civil war, these maps will be very useful for us, planners, and their digital formats will give us more opportunities to use them. | - | I would like to see local people employed in this type of project. | I request digital mapping of the entire northern region. The mapping of the Kilinochchi District where I work is essential. | GN administrative boundaries in Kilinochchi District where new administrative boundaries were established recently. | - | They will be required for establishment of administrative boundaries in Kilinochchi District. |

| No. | Organization | Name/Title | Use | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10 | SDSL | Illegible | I will use them for increasing the number of control points in Jaffna Area. The ortho images will be useful for the confirmation of each plot in cadastral surveying and a study on the control point network required for control point surveying. | - | On-line purchase and distribution via CDs at SDSL branch offices | All coordinate data should be based on the SLD-99. | — | A systematic mechanism for map updating will have to be established (as a mandate of SDSL). | — |
| 11 | SDSL | Illegible | I will use them for cadastral surveying. | — | Digital data should be purchased by those who wish to use it. | As quality of photographic data deteriorates with time, maps of the remaining area of 7,000 km² should be created in near future. | If production of 1/10,000-scale map is delayed, ortho photo mapping should be considered. | I request extension of the project so that the remaining areas can be mapped. I also request update of 1/50,000-scale maps. | — |
| 12 | SDSL | Illegible | They can be used for various projects and construction works. They can also be used for land registration. | — | The data should be provided free of charge. | — | — | I request expansion of the mapping to the unmapped areas in the northern region. | — |
| 13 | SDSL | Illegible | They can be used for a study on a project in an area where it is difficult to implement a field survey because of the opposition from local residents or cost or time required for such a survey. | — | All organizations should be notified of the availability of the topographic maps produced in this project. An incentive for the use of the data produced in this project shall be created by reducing the price of data provision. | I recommend production of 1/5,000-scale maps of areas where it is not possible to implement field surveying. | The digital topographic maps can be used for designing irrigation channels. (Yanoya Leanamadu). Use of them in an irrigation project in Malathiwa Area. | We have done a good job. All organizations should be notified of the availability of the topographic map data. It will be better if we can develop a project of producing 1/5000-scale topographic maps from this one. | Use in Bim Saviya and tourism. Use for cost reduction. |
| 14 | SDSL | W.A.K. Wisumperuma, Assistant S.G. | They can be used as 1/5,000-scale base maps in cadastral surveying (use for surveying of each plot). | — | A further study is required to decide whether all or part of the digital data produced in this project should be distributed. Consideration should be given to the price of data provision to projects, etc. implemented by the government. | SDSL should become able to update the data as a mapping organization. | Consideration to cadastral surveying. | I expect JICA's assistance in aerial photography of other regions. | Bim Saviya. |
| 15 | Civil Aviation Authority | Director | The topographic data on the maps can be used in a study on flight obstacles and taking-off and landing of aero planes in the northern region. | — | Data on artificial structures and accurate elevation data of high-elevation areas are useful for preparation of flight plans. | Same as on the left | Ratunayaku, Ratmalam, etc. | This project is very useful. | — |
| 16 | NBRO (National Building & Research Organization) | Senior Scientist | They can be used in field identification. | — | In order for the data to contribute to rapid development, maps will have to be updated every two years. However, such update will require considerable cost. | — | — | Data at the level of the Bim Saviya data shall be provided to other organizations. | I would like to have colour ortho images of the central region, in addition to the northern region, in future. |
| 17 | EMSO (Private) | Illegible | They can be used in GIS applications. | — | — | Nothing particular at the moment. | — | — | — |
| 18 | Central Environmental Authority | C.H.Edussuriya | They can be used in studies for EIA and surveys on and planning of production of environmental data for each area. | — | There is demand for acquisition and provision of topographic map data. | These maps are required for identifying environmentally sensitive areas and areas to be protected in the northern region in which development is in progress. | Central region, Uva Province, Colombo District. | — | — |
| 19 | UDA (Urban Development Authority) | | Until more useful data becomes available, I will use the data produced in this project for formulation of plans and urban planning. * Is there a need for more detailed data? | — | The large cost of data creation is problematic. | I request production of 1/5,000-scale topographic maps of urban areas in the northern region, especially MC and UC Areas. | Production of large-scale maps of major cities in the northern region (Jaffna, Kilinochchi, Mannar, Vavunya, etc.) | — | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | CECB (Central Engineering Consultancy Bureau) | | I am involved in public works. I have been using 1/50,000-scale topographic maps for preliminary studies on development plans of areas which are not covered by 1/10,000-scale topographic maps. We will be able to use the maps prouced in this project effectively in our works. | — | It is still too early to make a comment. | — | | Since I am involved in flood control in Gampaha, I have interest in Gampaha Area. | — | |
| 21 | SDSL | Illegible | They will be very useful for development planning of the northern region. | — | Production of digital topographic map data of the entire country is a future task of SDSL. We expect assistance from JICA to this task. We would like to study the possibility of using satellite data. | — | | — | This project was implemented at an opportune time and very useful. | — |
| 22 | | | Since they represent the current conditions accurately, they will be very useful. Production of digital data has made it easy to select topographic features on each layer and has improved the efficiency of field identifications. | — | — | — | — | — | — | — |
| 23 | SLAF（Sri Lanka Air Force) | RRPWR Thilakarathne, Flying Officer | Data on topographic characteristics and densely populated areas created in this project will be very useful for flight control. | — | I intend to advise my colleagues about the use of the topographic map data produced in this project. | — | | Trincomalee, Chinabay. | I would like SDSL to transfer the technologies they have learned from JICA to us. | — |